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THE feature of the hour in the industrial world is the increase of strikes, the prospect of additional ones, and the magnitude these threaten to assume. A considerable time has elapsed since the relations of labor and capital were seriously disturbed. Strikes are being planned and carried out at a time when industry and trade have lost something of the impetus they had received, and profits of manufacturers are confessedly reduced. Some are for the maintenance of wages that had been received previously to notice of reduction by employers. Such is the case in the Harmony Mills, Cohoes, N. Y., involving 5000 workers, the employers admitting that their notice of a reduction of 10 per cent in wages was to head off the possible demand for an increase. The strike at the Lawrence Mills is also against a reduction. Then as to other strikes, as the *N. Y. Tribune* puts it: "The lumbermen of Michigan the employes in the glass manufactories in New Jersey, the bricklayers in Philadelphia, the locomotive builders at Paterson, the carpenters, shoemakers and railroad hands at Toronto, and the ship calkers and carpenters at Cleveland, all desire, in one form or another, better remuneration for their services. The great strike of coal miners in the Cumberland region, the strike of 3000 marble cutters, and that of the carpenters and joiners, iron moulders, coopers and coach painters of New York, all originated in demands for higher wages." So also the late movement of ironworkers at Cincinnati, which was met by concessions. Our last local movement in the direction of a strike is that of some of the employes of the Cleveland Rolling Mill Company, whose demand for higher wages has resulted in the closing of the soft steel mill at Newburgh. The coal miners of this State have become restless at a reduction of wages, and the meeting of a delegate convention of Ohio miners at Columbus on the 19th inst. appears not unlikely to result in a strike against the reductions that have been made in miners' wages. Strikes, in fact, threaten to disturb nearly every interest, and this at a time when such disturbance will be peculiarly injurious to production and trade. Strikes have not unfrequently occurred which have served the interests of employers by enabling them to clear off an accumulation of stock, and even advance prices. At the present time, however, when the utmost facilities of manufacturers are taxed, there are few departments of industry in which a suspension or limitation of labor is likely to prove beneficial from a business point of view. For strikes so general, a general cause must be sought, and the most potent would appear to be the advance in the cost of all the necessaries of life. Money has become less valuable, or, in other words, less can be purchased for it. Speculation has had much to do with this result. We may here quote advantageously the following sound remarks of the same contemporary on this subject: "Practically the wages of labor have been temporarily reduced by the increase in the cost of the necessaries of life. But the workingmen would be wise to remember that the increase is temporary, and due to disasters of which they have not hitherto seriously felt the consequences. Good crops, in all probability, will cause prices to tumble again within a few weeks or months. It is worth the while of the workmen to consider whether the losses of a strike may not better be avoided by enduring some inconvenience for a time." The Amalgamated Association of Iron and Steel Workers are considering the scale of wages in the departments of labor within their scope to be demanded for the year ensuing June 1. The nail plate rollers in all mills west of Pittsburgh will demand an increase of from fifty-five to sixty-two cents per ton, which is the price paid at Pittsburgh. Neither puddlers, heaters, rollers, nor any other branch of workmen will demand an advance over the present scale except the Western nail plate rollers. The probability is that all the scales will be signed both by the employers and employes. So many interests hinge upon or have their prosperity affected by the condition of the finished iron manufactures, that the prospect thus offered of continuity in the above lines is certainly gratifying.

CITIZENS of Cleveland generally cannot but favor the proposal, which is engaging the attention of the City Council, for putting telegraph wires underground. Stretched on long poles, they not only are offensive to sight but prove a source of constant danger. All sorts of objections are presented by the telegraph companies to underground telegraphy, as, for instance, the disturbance of the wires by induction or the neutralization of currents by too close contact of the wires, and the difficulty of making multiple connections; it has even been alleged that any underground system would require the constant tearing up of the streets for repairs. Any one who has visited European cities where the wires are laid away from sight, and witnessed the repairing going on without either breaking up the street or disturbing traffic, knows the absurdity of the latter allegation. In London, where pipes are laid beneath gutters, even the gutters are left undisturbed, the lines being reached by metallic openings into the pipes, from which a cut section is drawn out from time to time for examination and repair; outside the city proper wires run over house tops. In Paris the telegraph wires run along the tops of the sewers. We are glad to find Mr. Edison, in his testimony before the Senate sub-Committee in regard to putting wires under the streets, and which is now holding session at New York, averred that having made subterranean telegraphy a part of his study, he was of opinion that the proposed system of underground wires was scientifically and commercially practicable for telegraph, telephone and electric light purposes. He thought that in five years the saving of expenses incurred by fire and storm would more than compensate the companies for the cost of putting the wires down. Mr. John Krucsi, of the Electric Tube Company, concurred with Mr. Edison in regard to the practicability of an underground system. What has been accomplished so successfully abroad can be accomplished here, and we trust the time is not distant when overhead lines in cities will be a thing of the past. We may notice singular contradictions in the evidence given in New York. One expert stated that it would take twelve years to lay the wires in the city's 366 miles of streets without obstructing business; another that it could be done in one year. One expert affirmed that there were 30,000 miles of telegraph wire stretched over the city, another that there were less than 10,000 miles.

THERE is a general concurrence of opinion that the present session of Congress should not pass without the passage of a Bankruptcy bill less complex in its provisions and less expensive in its operation than that which now exists. The discussion outside of Congress of the bill which has been reported favorably on by the Judiciary committee of the Senate has developed a variety of opinions as to some of its provisions, so far as regards its effectiveness, as, for instance, that which provides that the debtor shall surrender his estate, "except so much as shall be exempt from execution under and by the laws of the State where he resides." The drafter of the present assignment laws of the State of New York, who doubtless considers his work perfect and universally applicable, observes: "Most of the Southern and Western States have special exemption laws which protect a large portion of a man's property from execution. Some of them, for instance, exempt a man's residence, no matter what its value; though it may be worth $50,000 and his debts only amount to $10,000. In the face of such exemption laws and under the terms of this bill an Eastern creditor would be at a tremendous disadvantage." The reply is that Congress has no choice but to recognize the laws of States regulating rights of property. People giving credit should master the laws of the State in which their debtors reside and exercise proportionate caution. It has been at all times recognized as sound policy not to crush a bankrupt, but to afford him some means of starting afresh. Some State laws are on this point more liberal than others, and this is the whole substance of the complaint. The legal mind, according as it is biased, can present extremely specious reasons for rejecting the best provisions in a Bankruptcy bill, the whole force of those reasons lying in mere assumption. Thus one lawyer affirms that it would have been better if the bill, instead of allowing the estate to be placed in the hands of a receiver, the choice of whom rested exclusively with the Court, had prescribed the appointment of an assignee to be chosen by the creditors with the approval of the Court, whereas, as affirmed by an eminent New York merchant, the appointment of a receiver by the Court, instead of an assignee by the creditors, is one of the chief good features of Judge Lowell's bill. In nine cases out of ten the selection of an asssignee and the discharge by consent of the creditors is fraudulent. The debtor will generally get all his arrangements made with the necessary majority of the creditors before he goes into bankruptcy, and the minority must look out for themselves the best way they can, being powerless in the hands of creditors who have made their secret arrangements with the debtor beforehand and are cared for. They are thus generally led to take whatever is thus offered them, to avoid a costly contest. The Court under such circumstances could do nothing to help the defrauded and minority creditors. But under this new law the Court will have the power to look out for all that, and nothing can be done unless the proceedings are straight and regular. Again, a lawyer of high standing wants some limitation of time in the provision of section 6, that "any conveyance, transfer or payment made and received in view of

bankruptcy may be set aside if found to be contrary to the just rights of other creditors." For ourselves we think there should be no limitation, the phrase "in view of bankruptcy" clearly designating the character of the surreptitious act, which alone has to be considered. The bill is not illiberal to the unfraudulent bankrupt inasmuch as he is allowed his discharge on turning over to the receiver all his remaining property. The Lowell bill would appear to be the best bankruptcy bill yet proposed.

AT the Car Builders' monthly meeting at New York, the very interesting subject came up as to the relative merits of iron and steel in car construction. Mr. Forney referred to the fact that steel was taking the place of iron in many kinds of construction, and especially locomotives. In England a great variety of special forms were used in steel forging; die forging was more in use than in this country, and plate steel was pressed into almost any shape, so as to be adapted to a great variety of purposes. This kind of forging, if more extensively introduced here, would lead to the substitution of steel for all parts of cars where iron is now used, and making such parts lighter or else stronger with the same weight. It was also probable that the price of steel in future would not be any higher, and it might be even lower than a good quality of iron. Some objection was found by several members to the want of uniformity in truck frames of steel, a defect which, we have no doubt, will presently be got rid of. Mr. Howard Fry said that steel axles were very much used on the Pennsylvania railroad, and were not only considered superior to iron but equally as cheap. They had lasted longer and were less liable to break. He had no data to confirm this, but such was the opinion of those who were best able to judge of their performance on this road. With respect to the use of steel for the minor parts of cars, he had no doubt that the experience of some car builders was adverse to the use of steel. Mr. C. E. Garey had found that steel screws and steel wire nails were cheaper and better than iron. Mr. Marden of the Fitchburg road had not used steel screws and nails long enough to form an opinion as to results; neither had he any very definite views in regard to the entire substitution of iron or steel for wood as a material for cars; he thought, however, that a combination of wood with these metals was very much better than the exclusive use of either. Mr. W. A. Foster of the Fitchburg road was using steel for locomotive crank-pins and connecting rods, and also for tubes; he had no doubt that steel would yet be used for links. Mr. Fuller of the U. S. Tube Rolling Stock Co. referred to some iron tube cars recently exhibited at Troy. The form of construction had been changed somewhat, and as soon as the specifications were completed he thought a car could be shown that would combine all the advantages to be derived from iron as a material for the construction of cars. We have, said Mr. Fuller, no cast iron about the car, nor any combination of iron and wood. A channel iron end-sill is taken in connection with tubes which are forced against the inside of the end-sill and drawn together by iron rods running through them, forming a rigid framework. Between these tubes, over the truck, is formed a bolster by the use of channel iron and malleable iron. These tubes are held in relation to each other, fixed one above another by malleable iron castings. With a camber from the centre of the car to the end-sill, with the tubes fixed to each other, there can be no possibility of the car buckling forward in the center. Attempts are being made to build an iron car that will not exceed the expense of a wooden one with the same capacity. What all are endeavoring to reach is the maximum strength with the minimum weight. The only thing that stands in the way is the expense. What is wanted is a steel car of no greater expense than wood that will carry the load, that will have the capacity, weigh less and cost as little or very little more than the present car. It is evident that the repairs for steel cars will be at far more distant intervals than those for wood, and that the expense, on the whole, will be less. We believe that the introduction into the body of a car of wrought iron and malleable iron will solve the question.

THERE is certainly truth in the statement of the *N. Y. Shipping List* that the mania for speculation of a questionable kind has increased so rapidly that there is scarcely a branch of wholesale business that has not been tainted with its pernicious touch. Beginning in this country with money and stocks, it has gradually extended to cotton, grain, hog products, manufactures, and other staple products. "Corners" have become the order of the day. Legitimate supply and demand does not, as it should, regulate the values of the country, but they are regulated to suit the convenience of cliques of speculative gamesters in the great business centers of the country. The evils resulting from mere gambling operations in the necessaries of life has attained to such proportions that public opinion is becoming aroused to the necessity of trying some remedial measures. The whole system of "futures," "options," "puts," "calls," and the like is wrong. In these days of instant communication and rapid transit there is not the slightest necessity of engaging for the delivery of any article at a given point six months or a year ahead of the date at which the article is needed, as is done in the present "future" or "option" system. Besides, not more than one in a hundred of these contracts is bona fide or intended to be fulfilled in fact, either on the part of the buyer or seller. For example, it is notorious that the entire cotton crop is sold, on paper, scores of times during the year and the great majority of cotton "futures" have come to be regarded as gambling, pure and simple. It is doubtful, however, whether anything of a remedial nature can be effectually accomplished by the law where the business of "options," "futures" and the like is indulged in by so large and influential a class of people, and involves such powerful interests. Our contemporary suggests that it would be possible for the Boards of Trade and the Commercial Exchanges to prevent any body of men from conspiring to enhance the necessaries of life to fictitious values by unitedly declaring against such pernicious practices, especially if the banks could be induced to lend their assistance by refusing to furnish the funds necessary to carry on legitimate speculation, but, we would ask, How are the banks, even if so disposed, to discover the object of loans? Their business is not of an inquisitorial nature beyond looking to the character of the securities offered. On the other hand, the very members of Boards of Trade and Commercial Exchanges include commercial speculators. Of speculation there will and can be no end.

AT the regular meeting of the Engineers' Club of Philadelphia, Mr. W. S. Auchincloss exhibited his averaging machine, which consists of a stand with two uprights which support a rectangular pan twenty nine inches long and about ten inches wide. The edges of this pan are formed of tubes, which slide through the bearings and enclose rods forming counterweights. These rods are connected by pulleys with the pan so that when it is moved in one direction, they move in the other and so preserve the equilibrium. The pan is divided into equal grooves at right angles to its length. Paper scales, graduated for various uses, accompany the machine, and the adjustment is so accurate that the absence of a scale, which forms part of the balanced weight of the pan, throws the machine entirely out of balance. A convenient series of weights is provided to compose the quantities to be averaged. These are placed in grooves opposite their appropriate points on the scale, the pan is then slided until in equlibrium, and the average read at once from the scale, at the point of support. This machine was designed especially to average commercial accounts, and can solve one hundred accounts per hour and work both sides of ledger at once; but it is also adapted to ascertain the average haul of earth, speed of pulleys, &c.

THE resistance of traction on streets is necessarily an interesting topic, both with reference to their paving and to traffic. The subject was taken up at the last meeting of the Engineers' Club of Philadelphia, when President Rudolph Hering remarked that resistance varies nearly as the weight, being great for heavy loads and almost nothing for light pleasure carriages. It increases on paved streets with the velocity and as the diameter of the wheels becomes less. The width of the tire has little influence on hard and smooth roads, especially for light loads, while it has considerable influence on soft and rough roads, particularly when the load is heavy. The most economical conditions for traction, therefore, are a hard and smooth surface, large wheels and broad tires; the latter for heavy loads drawn on rough roads. To draw a load on sand requires a power equal to one fifth its weight, on ordinary earth one-tenth, on hard clay one-twentieth, on ordinary cobble stones one-sixteenth, on good cobble pavements one-thirtieth, on ordinary Belgian blocks one-fortieth, on London blocks one-sixtieth, on asphalt 1-133, and on iron rails one 200th of the load. The economy in horse-power obtained by using the hardest and smoothest roads is thus clearly shown. If one horse can just draw a load, on a level, over iron rails, it will take one and two-thirds horses to draw it over asphalt, three and one third over the best Belgian, five over ordinary Belgian, seven over a good cobble stone, thirteen over a bad cobble stone, twenty over an ordinary earth road, and forty over a sandy road.

A PROMINENT manufacture in Cleveland is that cornices, which at present must be regarded as in a highly flourishing condition. From time to time, owing to variations in the market for galvanized iron, prices have been so unsettled as to cause contracts to be undertaken at a loss. A number of small manufacturers would be induced to enter into it when prices were low, their competition lowering profits all around. Since the recovery of the metal trade from former depressions, cornice works properly equipped have been busy and the proprietary have done well. Unprecedentedly large orders are on hand for cornices both here and at Dayton, Salem, Cincinnati and other cities in this State. It is estimated that in this year double the amount of work will be called for that has been required in any previous year.

THE Huber Manufacturing Company, Marion, have increased their capital stock from $75,000 to $150,000, the additional stock being readily subscribed and paid in. They make a specialty of farm engines and threshers, of each of which they will make about two hundred this season. They also manufacture revolving hay rakes and road scrapers. All their work is covered by their own patents.

MANUFACTURES.

TO MACHINISTS. MANUFACTURERS AND OTHERS.

THE publishers of THE TRADE REVIEW solicit items of information concerning manufacturing and other establishments in any part of the country, and all such items will be promptly inserted in these columns, free of charge. Facts are the only things needed; and all communications should be accompanied with the name of the contributor—not for publication—but as a guarantee of good faith.

Manufacturers, machinist and engineers are particularly requested to communicate any matters of interest relating to their specialties. No one need be deterred from sending any interesting facts in his own language, as all such contributions will be properly revised before sending to press.

OHIO INDUSTRIES.

THE Cuyahoga Works of Cleveland have just completed the third steam helve hammer ordered by the Cleveland City Forge and Iron Company for their new works on the lake shore. This last hammer is without doubt the largest steam helve hammer in the world, the steam cylinder being 36 inches bore. The hammer is fitted up with the patent valve and valve gear, and when set up on its foundation will be able to forge shafts up to 28 or 30 inches diameter with ease, and cranks of any size required. This is but one of many undertakings by the company that have contributed to the mechanical reputation of Cleveland. To go beyond even British and continental makers in helve hammers is something to be proud of. Large as is the steam helve hammer just completed, we fully anticipate that it will yet be exceeded in dimensions at the Cuyahoga Works.

WHEN the Akron Rubber Works get into full operation they will have a force of 90 to 150 hands.

THE Globe Manufacturing Works, Niles, is jus beginning the manufacture of the Acheson Measuring Pump for the company controlling its sale.

THE Diamond Glass Company, Urichsville, has been incorporated with a capital of $40,000; also, the Canton Paper Company, Canton, with a capital of $75,000.

WILLIAM TOD & Co., Youngstown, are building a 28x48 engine for the Junction Iron Company, of Mingo Junction, O.; also some heavy machinery for the Ohio Powder Co.

ASHTABULA citizens offer the N. Y. C. & St. Louis Railroad all the land they want, and $10,000 if they will locate their eastern terminus and repair shops at that point.

FOSTER & CUNNINGHAM'S spoke factory, Fostoria, burned down not long since, has been united with the Findlay Bending Works. The new building has been begun.

THE Gill Car Company, Columbus, are building thirty screw lever dump cars, under the patent owned by the United States Car Company, of Boston, for the Columbus, Hocking Valley & Toledo road, and fifty for the Cleveland Rolling Mill Co.

MORLEY & Co. are doing a fine business at their pottery in Wellsville. Their iron stone China, decorated ware and American majolica enjoy an enviable reputation all through the country.—*Am. Pottery and Glassware Reporter.*

IT is reported that the Timms Car Works, Columbus, are in a fair way to be put upon a sound basis again. At a meeting of the creditors the liabilities were found to be only $90,000, with assets between $140,000 and $150,000. The company has several large orders on hand and will continue working at its full capacity.

THE Fowler Mining Co. of Newark have just shipped two large Fowler patent vertical water tubular heating boilers to Cambridge, to be used in heating with steam the Guernsey County Court House. This company is doing a large business in manufacturing these heaters, and are setting them in several public buildings in Ohio.

THE Enterprising Manufacturing Co., Sandusky, are doing a large and prosperous business in manufacturing wooden baskets of all descriptions. The company start with the log as it comes from the forest, saw it to proper lengths and steam it, run it from the steaming house to the veneering machine, a splendid piece of mechanical invention that revolves the log against a knife gauged to shave it up into one long strip of veneer, the thickness of a finger nail. A huge cutter, worked automatically, cuts these thin strips into splints the proper width. On this follows the braiding operations.

BIXLER'S cracker factory, Youngstown, has been started.

THE Youngstown Car Works are building "flats" for the Lake Erie Road.

THE rolling mill at Columbus is filling a contract for 6,000 tons of steel rails.

CORL & RANK, millers, Canton, are putting in the Stevens roller mills.

THE Sandusky Plow Company has been reorganized by the wealthiest capitalists of that city.

THE Cincinnati Operative Cigar Company has been incorporated with a stock capital of $5,000.

THE Buckeye Coal and Iron Company of Columbus has been incorporated with a stock capital of $2,000,000.

THE Beacon says that Pittsburgh parties, who are patentees of a tumbler, are considering the advisability of establishing glass works at Akron.

THE Greenville Rolling Mill is now the largest in the Shenango Valley, with one exception, employing 250 hands, and turning out 50 tons of manufactured iron per week.

THE contract for building a new bridge over the Shenango at Mahonington has been awarded to the Morse Bridge Co., Youngstown. The structure will be 425 feet long, and cost $12,000.

THE Dayton Screw Company, Dayton, is now fully organized, with Mr. Albert G. Angell as president, and Mr. Samuel L. Worsley, superintendent. The works, which have been standing idle for several years, have been placed in complete running order, and new and most approved machinery added. In a very short time they will be in full operation.

HOUGHT & DAVIDSON, New Philadelphia, are manufacturing a machine which dispenses with the method of driving in the axle boxes of carriages and wagons by means of sledges, substituting a screw which affords sufficient pressure to force the boxes into the wheel without the danger of bruising or breaking them, and fitting them much tighter.

THE new furnace and nail works at Ironton is an assured success. The capital stock is to be $300,000. It is proposed to put the works on the present ground of Grant furnace, which the proprietors offer to the new company for $25,000. There are six or seven acres of land in the tract. The idea is to erect a 40 ton stone coal furnace and a machine nail mill.

AT Hamilton Messrs. Black & Clawson, manufacturers of all descriptions of paper mill machinery, are full of orders, and are constantly shipping machinery to all parts of the country. They have the control of "Holloway improvements in means and methods of making Four-drinier paper," which is said by those who are acquainted with the facts to be of immense value to manufacturers.

A CORRESPONDENT of the *Boston Commercial Bulletin*, writing of Cleveland, says: Undoubtedly this city possesses business facilities surpassed by no city in the West, but its climate is decidedly against it. It has increased its population 27,000 souls within the last ten years, and still continues to grow. Business firms from the East have transferred to this city within a twelve month numerous iron, brass and carriage works, etc. Skilled labor is hard to obtain, and the lack of this element alone prevents a still more rapid increase in the size of the city.

FEW manufacturing establishments have contributed more largely to spread the fame and reputation of Akron as a great manufacturing center than Taplin Rice & Co.'s Akron Machine Works. They are manufacturers of steam engines, mill gearings of all kinds, heating and cooking stoves, etc. These works were established in 1861, by thoroughly practical founders, and the machinist business was carried on successfully for a number of years. In 1867 when it became an incorporated company they commenced to manufacture cooking and heating stoves in connection with their former business. In a short time they have replaced two cupolas, put in a new blower, built an addition to their buildings, and made several other improvements, besides purchasing the old Empire Mower & Reaper Works. The main works now occupy two lots, one 200x360 feet, and one 120x180 feet. There are twenty moulders at work. The company makes a specialty of sewer pipe presses.—*Akron Sunday Gazette.*

THE combined capacity of Louis Cook's three new carriage factories in Cincinnati is said to be several hundred vehicles per week. At these magnificent works 500 men are employed.

INDUSTRIES IN GENERAL.

A COTTON-SEED oil mill, with a capital of $50,000, will soon be erected at Albany, Ga.

THE Virginia sumac industry is on the increase. The value of the annual product is about $250,000.

A COMPANY is to commence at Atlanta, Ga., March 1, on a factory for the manufacture of stationary engines.

A WRINGING-MACHINE company at Woonsocket, R. I., manufactured 9,500 wringers during the month of March.

THE Mississippi Mills Co., at Wesson, Miss., will soon build another large cotton mill, to cost not less than $300,000.

ONE hundred thousand dollars has been subscribed towards building a car wheel factory at Fargo, Dakota Territory.

THE Indiana Car Co., Cambridge City, Ind., has been incorporated; capital stock $100,000. Wm. McMillan heads the directory.

THE Gilbert Car Works, Buffalo, N. Y., have taken a contract to build 200 construction cars for the Jersey Shore, Pine Creek & Buffalo Road.

THE one or two mills in Florida employed in the manufacture of paper from palmetto fiber are to be supplemented by from fifteen to twenty.

THE pipe mill of Reichelt, Sandford & Co., Chicago, Ill., is producing 200 tons of piping every month. The company have recently enlarged their works.

CHICAGO has twenty-eight brass and copper works, having a total capital of $800,000, employing 850 workmen and turning out an annual product valued at $1,650,000.

THE Reading Pipe Works, Reading, Pa., have just closed a 100 mile contract for 6 inch pipe, to be used in the construction of an oil pipe line from the interior of that State to the Delaware river.

THE Chicago Bar Axle Co., Chicago, Ill., has been reorganized, and will hereafter be known as the Chicago Forge and Bolt Works. It is building new shops. The machinery will be ready in about two months.

THE Clayton Steam Pump Works, Brooklyn, N. Y., report recent shipments embracing duplex air compressors to Pennsylvania, Colorado, Virginia and Jamaica, West Indies, and that they are now building a large compressor for California.

AN important addition has been made to the industries of Indianapolis in the line of auger and bit making. The establishment is located at 22 East South street, and is carried on by M. Gaunt. The goods manufactured are of A 1 quality and warranted.

IN 1777 considerable interest was manifested in an announcement that six stoves had been completed in Philadelphia. The annual product of the stove foundries in that city is now valued at $4,000,000, and the industry supports about 12,000 people.

NEW machinery has recently been added at the button works in Burlington, Vt., which increases the production about 100 gross per day. The company now has a larger force than ever, and is doing a greater amount of business.

THE Indianapolis Car Works, Indianapolis, Ind., now employ 592 men and are turning out 12 freight cars and 108 car-wheels a day. The shops have turned out 1,195 cars since they were first opened last July, and have orders on hand for a large number.

THE Disston Saw Works, Philadelphia, Pa., is the largest establishment of its kind in the United States. They consumed last year 21,000 tons of coal; 10,000,000 feet of lumber; worked into edge tools 80 tons of steel per week. For files alone they used 450 tons of bar steel. The output of manufactured goods was as follows: 3,800 large and 39,000 small circular saws; 1,250,000 long saws; 201,500 dozen files, and a large quantity of miscellaneous tools. They employ over 1,400 hands in their works. Their pay-roll is about $18,000 a week.

NEWARK, N. J., considering its size, is one of the largest manufacturing places in this country. There are over 1,000 industrial establishments within her limits. Her manufactured goods go to all parts of the world. Her tanneries are now on such a basis that they ship large quantities of goods yearly to England.

SCRANTON, Pa., is in the centre of the upper anthracite coal region, and has six important railroad lines radiating from it. It is the site of several of the Bessemer steel works in the United States, whose capital stock nominally exceeds three million dollars and intrinsically and commercially has twice that value. The product of one of these corporations during 1880, by the published census statistics, is reported at 151,263 tons of iron and steel, being mainly steel railroad bars, and their value is given as $5,400,085.

SEVERAL facts combine to make San Francisco buckskin gloves eagerly sought in Eastern markets. The leather is of the finest description. As deer are very plentiful in California, their hides are brought in large quantities to San Francisco, and are tanned to perfection. The many glove factories vie with each other to turn out a very superior article; the best male cutters are employed, and the remainder of the work affords employment to a large number of skilled women. This industry is protected by a high duty—some 35 per cent.—a fact which should cause it to flourish wherever a factory can be founded in a suitable locality.

WE understand that the Chicago Car Axle Co. has purchased the Forge Works at South Chicago, and a large tract of land adjoining, and is now building new shops 300 feet long, and upon their completion will engage in the manufacture of all kinds of bolts, in addition to the business of steam forging. The machinery is already being made and will be ready in something over a month. The force of workmen will be increased by over 100 over that now employed. The company has been reorganized and incorporated under the title of the Chicago Forge and Bolt Works.—*Western Manufacturer.*

THE North Adams, Mass., Marble Company, promises to become an important industry. The company has already purchased the property, consisting of 40 acres of land near Hudson's Brook. The present buildings are being rebuilt and enlarged, and machinery to perform the new patent process put in. By this new process the granulated marble is reduced to an impalpable powder. When the works are in full operation 60 tons of dust per day will be made. The dust is used largely in the manufacture of putty, and for neutralizing acids in grape sugar manufactories, 600 tons or 60 car-loads having been used by one sugar factory in a year.—*Boston Commercial Bulletin.*

LUMINOUS GUIDE PLATE.—A curious little item has just been introduced to the London hardware trade, under the title of the "Household Luminous Guide Plate," which seems to answer various requirements where people want to "light up" dark corners or gloomy corridors. It is a zinc plate 2¼ in. by 1¾ in., covered with a coat of luminous enamel, and may be easily fixed anywhere by a couple of tacks. Placed near door knobs, letter plates, bell pulls, or as cautionary marks on balusters, awkward steps, &c., the "Guide Plate" will no doubt be very useful; or figures, or letters may be painted, with the number of house, if required.

LATENT DEFECTS IN MACHINERY.—As bearing on the liability of employers, the Supreme Court of Wisconsin has decided that where the injury to the servant is the result of a latent defect of machinery, of which the master had no prior knowledge, and which was not discoverable by the exercise of ordinary care, such master will not be held liable. An employe cannot recover for an injury suffered in the course of his employment from a defect in the machinery used by his employer, unless the employer knew or ought to have known of the defect and the employe did not know of it, or had not equal means of knowledge. An employe who has knowledge of defects in machinery about which he is employed, or who might know them by the exercise of reasonable care, cannot maintain an action for injuries resulting therefrom, if he continues in the employment without objection.

WHEN writing to advertisers mention this paper.

Key Seating Machines, Drill Presses, &c.

The establishment of Mr. W. P. Davis, North Bloomfield, N. Y., where are manufactured upright drill presses, key-seating machines, apple grinders, &c., exhibits in all departments an activity which bespeaks abundant orders, and is a promising augury for the future. His works are running night and day to cope with orders. This manufacturer has long enjoyed the distinction of securing the best material and the best workmanship. His great mechanical ability is illustrated in the improved construction of his machines, and the accuracy of the workmanship. His drill presses and key-seating machines are used in many of the best shops in the United States. They have stood every test that can indicate durability and efficiency, and are in demand wherever they have been sold. They go all over the country, and considerably into the export trade. The machinery plant of the works is perfect to the minutest details, which fact has doubtless materially aided in securing the excellence of the products of this concern as to finish and quality. Ever advancing in enterprise, Mr. Davis has lately added new and powerful lathes and planers, his additional facilities enabling him to turn out double the former amount of machines. He is building a new furnace, and will hereafter do his own castings. The orders he is now busy in executing are from Boston to San Francisco, and include a number from Denver and other remote points, thousands of miles from his shop, for his now famous key-seating machine, which has already been described and illustrated in this journal, and is in every respect the most efficient that has ever come under our inspection. It has given great satisfaction wherever it has been put in use, and if kept constantly employed will do immense service. Mr. Davis has special freight rates to nearly all parts of the United States.

Copper Ore Smelting.

In this country, copper ore smelting, as disconnected from concentration at the mines, and distinct from the melting and casting of native copper, was carried on for some years in five different places—at Boston, New Haven, Taunton, within New York Harbor, and Baltimore. As elsewhere, the cost of carriage of that part of the ore, or concentrated product which is not copper, discriminates against this particular industry, which is bound to decrease in extent as facilities in the mining regions themselves increase. Geographically as well situated as England for drawing supplies of ores from abroad, the economic conditions, however, when at their best, were unfavorable compared with those at any time obtaining there. The home mines were not very important; hence the natural basis for the business of such works remained local, and since spontaneous arrivals of ores from South America could not always be counted upon, heavy commercial risks of importation had to be taken. The industry enjoyed some protection through customs tariffs, but, of course, only against foreign competition. Only one of the six works at one time running is now in existence, and flourishing—the one at Baltimore. And it is a stubborn fact (stubborn as anything Welsh can be—which surely is emphatic enough), that the main reason why that establishment is in existence, and the others not, lies in the steadfast faith, incarnate there, in Mr. Vivian's doctrine, "South Wales against the world." Adhering to the Welsh copper smelting process pure and unchanged, the Baltimore works had turned out *good* copper for brass. The other works, having mixed in the German practice of blast furnaces, never had. That one main result, good copper, could be relied on at Baltimore, and upon the faith of it there was again built up a business which at this time has assumed large proportions and rests upon a solid basis. The Baltimore Copper Works were started in 1844, by a stock company, called the Baltimore & Cuba Smelting and Mining Company, in connection with a mining scheme never undertaken. Prominent merchants of Baltimore, however, became identified with it, and smelting was seriously undertaken. A whole colony of smelters was imported from Wales, and the furnaces built on Locust Point, where now are located the grain elevators and steamship wharves, but then a waste tongue of land; historical ground, however, as on it waved the star-spangled banner of Fort McHenry. The company subsequently divided, and Dr. Keener built in 1846 new works on the opposite shore, at Canton. The Welsh smelters, transplanted from a field where the ugly, rebellious ores of Cornwall, etc., made success in good copper smelting difficult, as Mr. Vivian amply testifies, encountered a new condition of things at Baltimore. Instead of finding impure ores, instead of having to practice the selecting process and making several grades of copper, they found only pure ores, and could only make one grade of copper, and that better than any they had been able to make from the promiscuous ores sent to Wales. They found the best of long-flame coal only as fuel, instead of the laborious mixture of coal imposed on them in Wales. They were allowed to retain their customs and liberties, and thus really transplanted their particular industry in its integrity to Baltimore; were content, and taught the handicraft to their sons. That they made uniformly good copper, was due to their skill and discipline no more than to the fact that tin, nickel, antimony, arsenic did not exist in the ores which came into the works from the Rocky Mountains. These pure pyritous ores were a very different furnace material, had a very different effect in mixtures than those at home. Hence, the work of the men resulted better in all respects than in Wales. The brand of "Baltimore Copper" became as famous as the painstaking manager, Dr. Keener, became popular in the manufacturing districts of New England. His chief smelter, Mr. Davis, is still superintendent at the works.—*N. Y. Engineering and Mining Journal.*

Defects of Castings.

Among the defects of castings that of honeycomb is perhaps the most common and the most serious. It is only when these occur near the surface that it is possible to detect them. Sometimes a minute pin hole at the surface, when followed up, is found to lead the way to a mass of deep-seated cavities. The temptation of the iron founder is to conceal any such hollows, when visible, by running lead in them or by some similar device. This should always be discountenanced in the sternest manner. On the other hand inspectors will often condemn a casting for a slight surface inequality, scarcely more than a roughness, which is of no real significance whatever. Another surface defect is the "cold shut" where the metal at some particular spot has set too hastily, and produces a piece of hard white metal embedded in the gray. Such are always places of weakness, but are not generally large enough to be serious. A worse failing is brittleness, which is generally due to the use of inferior pig or to haste in cooling. This can only be provided against by testing samples of the castings made to ascertain their strength. Where large contracts are in hand a bar or two is generally cast at each melting, and tested by hanging weights from the middle or by breaking with a hammer. Lastly, it may be remarked that all inspection of castings should take place before they are painted, as that operation gives ample scope for the concealment of defects.

Shoeing Flat-Footed Horses.

A correspondent of the *Blacksmith and Wheelwright* writes: If a horse has a spongy toe it may be cut off to its proper length. After this is done the horse will travel easier than before. If, on the other hand, there is a hard shell all around the hoof, it is best to cut as little as possible as to the sole. If the sole of foot is thick, let the shoe bear on the sole and hoof equally, but if the sole is thinner, dish or concave the shoe so as to bear on the rim only. Another correspondent writes: I have had the best success in making the inside of the shoe the shortest, but this has not been satisfactory in all cases. I also turn the inside calk the heaviest, making it stand lengthwise of the shoe, or the same as a calk turned half around; then as I draw I incline it a little under. I take care not to let the shoe lay out past the hoof toward the heel, as this interferes with the action of the horse.

NEW YORK CITY has 386 miles of sewers, 512 of water mains, 885 miles of gaspipes, 7 miles of tubes for telegraph wires, 1 of steampipes, and three-quarters of a mile of pneumatic tubing. When the telegraph and telephone wires come to be put under ground they will be reckoned by the thousand.

THE practical $5 Standard Electric Belt advertised in this paper should not be confounded with other electric goods.

PRACTICAL MECHANICS.

Constructive Ironwork.

It is very necessary that designers of ironwork should make themselves acquainted with the dimensions of iron in general use, both as regards section and length, as the economical construction of iron structures depends as a rule more on the use of ordinary sections and lengths of material, than on great refinement of design. In bridge building, the using ordinary sections of iron can be carried too far, and rolled girders are used in places where built girders would answer the purpose better, and would be cheaper. It is necessary that all iron should be designed so that the joints may be placed in such positions as to be strengthened, as far as possible, by the surplus section of iron at some convenient point. It must be remembered that angle-iron cover-plates are seldom of either section with the angles they cover, therefore they must be supplemented, and this may be most economically done by making the joint at some point where there is already some section in excess of that required. If the sections for the sake of transportation are to be light and handy, any overhanging pieces of plate or angle iron are to be avoided; therefore in this class of work, all the joints should be as close together as possible, or, in other words, in a boom formed, say, of two horizontal plates, two angle irons and a vertical plate; and the covers should be disposed so that the several plates and angles may break joint to a sufficient extent to cover the section and no more. Theoretically a considerable saving in material may be made by placing the rivets in the booms, diagonally or zigzag; but in practice we have never found that there is any advantage to be gained by this arrangement, for unless every rivet almost is set out to special pitch, the attachments of the lattice bars, verticals or cover plates will place some pair of rivets in the same plane, and so do away with all the advantage to be gained by the zigzaging, and not only this but will also render the design useless, for it will no longer be up to the required strength. A common form of bracing is that where the horizontal strains are taken by four angle irons bolted to the flange bolts which join the different lengths of the columns. The diagonal bracing is made of flat bars, which are bolted to the horizontal angle irons This, again, is entirely a tensional bracing, so far as the diagonals are concerned, but it is better than the last because it is self-contained. The strain on the horizontal bracing is almost entirely in compression, therefore no tensional strain is put on to the cast iron, any such strains being transmitted from the diagonals to the bolts, and thence to the horizontal bracing, and the tensional strains on the cast iron commence at the foundation piles, and then they will only exist under exceptional circumstances. The objection to this system is that when the centre of the piles or columns are close, as is the case where the rails are directly above the girders, the columns being then placed at 5-foot centres, either the lengths of column must be so short as to be economical, or the angularity of the bracing with the horizontal will be so great that, not only will excessive strains be thrown on it, but it will be so great that, not only will excessive strains be thrown on it, but it will not, unless it be put into a considerable amount of initial tension, offer sufficient resistance to motion in the piers. If motion takes place in the pier, extra and uncalculated strains will be thrown on the bracing. It is not easy to place such a bracing in initial tension, there being no means of tightening the diagonals. In another arrangement again the diagonal braces are of round iron, and pass through the columns, and are tightened up against the outer side of each by means of nuts. This arrangement is satisfactory as a system of tensional brazing where the lengths of the columns are known, with the angle of the diagonals is 45° or thereabouts, and where the bracings are simple systems; but it is not so satisfactory where these conditions do not hold good. If there is more than one system of bracing, the column becomes too much cut about with bolt-holes and slots, the pull is not fair, and the braces get in the way of each other, or the column is subjected to a considerable bending strain. Cast-iron columns are in general use as foundations and supports for railroad bridges and viaducts, and for promenade and other piers. Cast or wrought-iron columns, especially where used in water, should be filled with concrete so as to prevent the presence of water inside them which might freeze and burst them, but where cast iron is used some elastic material should be placed between the concrete and the iron to prevent any chance of fracture from the expansion of the former; not that concrete should expand if properly used, but because it is often employed in a most careless and ignorant manner without cooling; and the test demanded by engineers is now so high that a much larger proportion of carbonate of lime is necessary than was formerly the case, and the chance of free lime being present is increased, and a more dangerous material is produced, which may, unless carefully managed, produce disintegration in any structure in which it is employed. Concrete in the proportion of 12 to 1, or even a greater proportion of gravel, may be used for this purpose.

Apprenticeship.

The decline in handicraft has been so frequently discussed, and so often lamented, that many who have no direct connection with the industrial and mechanic arts are led to believe that with all our improved machinery and processes the skilled workman is steadily and surely passing away; that it is only a question of time when he will have become a thing of the past. Assuming this to be true, and in a measure it is true, we think an examination into the facts may be interesting.

The old-fashioned seven years' apprenticeship has, so far as this country is concerned, passed away, and is now scarcely more than a tradition in the older shops; but we think the reasons for this change can be found in every well equipped modern workshop. The time was when trades had their guilds, and masters were directly responsible to the guild, and not less so to the apprentice, who became one of his own family and was lodged beneath his own roof. We do not undertake to question the thoroughness of the training, nor to dispute the advantages which were likely to accrue by reason of this intimate relationship between master and apprentice; the fact of its universal adoption shows that it possessed merit, and was well suited to the existing wants of the time. The real reason for the change lies in the fact that the times themselves have changed. Trade secrets are now rarely imparted from master to apprentice, as of old. Scientific works, treating of every branch of industry, have widely diffused information as to processes.

This system of apprenticeship had the effect of producing mechanics who were thorough workmen in their respective trades; to particularize, a machinist was expected to understand the whole business of machine construction, including also a general knowledge of blacksmithing, and not unfrequently the art of pattern making, molding and casting. Under the seven year rule this was quite possible, and was certainly advantageous to the individual should he ever begin business for himself or enter the employ of a large workshop as a manager. Aside from this, skill in handicraft was constantly improving; a marked advance in design as well as workmanship was apparent in every department of machine construction. This led to the perfecting of minor details in the first instance, and secondly, to a more comprehensive grouping of parts and special adaptation to certain uses, often involving radical changes in design. Nor was this confined to one department of manufactures. This influence was felt everywhere, and gave new birth to existing industries, which in turn gave birth to others. Transportation was greatly facilitated, and new means of communication were opened. New wants were rapidly being made known and almost as quickly supplied.

The small workshops became inadequate as larger and more expensive machines were developed, and thus larger shops became necessary. These were formed by consolidations, or by the combination of capital and labor. New elements were introduced into the management, guilds became less influential, masters were more self-reliant, and sallied forth single-handed to grapple successfully with problems of which, during the term of apprenticeship, neither they nor their masters had the slightest conception. The shop was lost in the manufactory as the range of work became larger. The master had less to do with details of construction, and became more of a man of business. These general workshops grew and became a local power; they overshadowed and absorbed the smaller shops; masters no longer took their apprentices into their own families; they were placed in charge of the foreman, and the older workmen in the shop instead; the social relations between the apprentice and the master were changed, but the methods of mechanical manipulation and the years of servitude were not.

The growth and development of these large and general workshops, in time, came to an end. Competition became stronger each year. Specialties in manufacture were introduced; buildings were erected and equipped with machines for the production of a single, or at most, a few articles having a large popular demand. These were no longer shops, but factories. The highest mechanical skill was in demand, and command good prices. So thoroughly was the subject considered in all its details that special machines were constructed capable of making one part only. With few exceptions, general workmen found no place in such a factory at prices which they had formerly been able to command; the machines were so constructed that laborers, and often mere boys and girls, were placed in charge as operatives. The apprenticeship system was not only in danger, but utterly ignored. Many of these new machines do not require skilled labor to operate them, and in consequence it is not employed.

This in a measure represents the condition of many of our leading manufactories of to-day. Good workmen are always in demand for special labor; they are needed for the production of these very machines of which we have just written. The workman who has passed through his seven years of apprenticeship is highly esteemed, especially if with it he possesses the qualities of a ready mind and a willingness to do! on the other hand the indifferent workman descends in the scale, even though he possesses a certificate bearing the magic number seven. This change in the management of workshops has practically put an end to the apprentice system in this country, and it is not clear that we are particularly the losers by it. It is true, chippers and filers bear a less proportion now than twenty years ago, but to offset this there is less need for them; planing, shaping, slotting and milling machines are doing now what the old-time machinist did with hammer and chisel. The scraper has usurped the place of the file in fine fitting, and it is also used for surfaces which were formerly fitted with emery and oil. In short, the new methods have supplanted the old.

It is no doubt true, when taken at large, that man for man, the present numerical force in the modern workshop is deficient in mechanical skill as compared with the workshop of, say, twenty-five years back; but it should be remembered that the skilled mechanic of to-day holds a different and a higher position in the workshop than that of twenty-five years ago. This higher position does not necessarily imply greater authority, but it does carry with it greater responsibility and a corresponding rate of pay, to say nothing of the increased certainty of employment throughout the year. At the same time the average mechanic, whatever may have been the number of the years of his apprenticeship, is likely to remain stationary, and at a much lower rate of pay than the former. Just here is where the superior intellectual training of the graduates of the technical schools is likely to interfere with the advancement of the better workmen from this average class into that of the higher class. In this struggle for supremacy in the workshop of the present and future, the prospective advantage to the higher class of workmen is likely to include a discussion of the relative merits of a technical education as compared with that of a long apprenticeship, a question which we cannot enter upon at this time; but one thing is certain; under the present system of workshop management, and the employment of special machinery, and the excellence of our technical schools, the days of long apprenticeship are among the things of the past.—[Indianapolis Mechanical Journal.

Burnishing.

By burnishing, the roughness of an object is flattened down until the surface is smooth and polished like a looking glass. Burnishing is an important operation for electro-deposits, which consists of a multitude of small crystals, with intervals between them, and with facets reflecting the light in every direction. The deposited metal is hardened, and forced into the pores of the underlying metal, and the durability is thus increased to such an extent that, with the same amount of silver, a burnished article will last twice as long as one which has not been so treated. The instruments employed for burnishing are made of different materials, and must be of great hardness and a perfect polish. Such are hardened cast steel, agate, flint, and blood stone. For metallic electro-deposits steel and blood stones are especially employed. There are several qualities of blood-stone; its grain should be close, hard, and without seams or veins; it should leave no white lines on the burnished parts, nor take off any metal, and its color should be of an intense black red. The steel must be fine and close grained, and perfectly polished. Should the polish of any burnishing tool alter by use, it is restored by friction upon a skin or leather attached to a wooden block, which is fixed to the bench. The leather is covered with polishing rouge in impalpable powder, or, preferably, with pure alumina, obtained by calcining ammonia alum in a forge fire. Venetian tripoli, rottenstone, tin, putty, emery, or many other hard substances finely powdered, may be employed. The burnishing tools are of various shapes, such as a lance, a tooth, a knife, a half sphere, or a dog's tongue, and a considerable stock is necessary. The burnishing is divided into two distinct operations. The first consists in roughing, and the second is finishing. The tools for the first have a sharp edge, while for the second operation they have a rounded surface. The tools for the hand or the lathe are fixed by copper ferrules into short round wooden handles, so that the hand is not influenced by their weight. The tools for the arm or vise are fastened to wooden handles sufficiently long to rest their slender part upon the arm or shoulder. The stouter lower portion is grasped by the hand. The burnishing tools and the objects must be frequently wetted by certain solutions, some of which facilitate the sliding of the instrument, or with others which have a chemical action upon the shade of the burnished articles. Of the first are pure water, solutions of

soap, decoctions of linseed, and infusions of the roots of marsh mallow or licorice. The second includes wine-lees, cream of tartar, vinegar, alum in water. When burnishing gold is applied upon electro deposits of copper, as is gilding with a dead luster by that method, use pure water, for fear of producing a disagreeable red shade. The surface is then wiped longitudinally with a soft and old calico rag. The polish obtained by burnishing is called black when it reflects the rays like a mirror, and should the presence of the mercury or a bad deposit prevent the tool from producing a bright surface, the object is said to be greasy. Articles which have been previously polished, and which generally receive a very trifling deposit, are not burnished, but rubbed with chamois leather and the best polishing rouge. Too thick or too rapid electro deposits cannot be burnished, but must be polished by rubbing with a leather and a mixture of oil and powdered pumice stone, tripoli, or tin putty. Coarse powders are used at the beginning, and impalpable ones at the end of the operation. Polished silver deposits are more agreeable to the eye than burnished ones, but the hardening of the latter renders them more agreeable to the eye than burnished ones, but the hardening of the latter renders them more durable.

Getting Up Steam.

An old shipmate, now chief engineer of one of our largest steamship lines, of experience among engineers and thoroughly practical in every department of the steam engineering service, used to say there were few among our best engineers who properly understood how to charge a furnace and get up steam. All things considered, he regarded that job when well done, as one of the most important duties in the business, and one of sufficient importance to be done by the engineer, or at least immediately under his direction, and not, as is commonly the case, intrusted to a fireman. Filling boilers, charging furnaces and getting up steam are considered very ordinary duties by most engineers, who would smile derisively if it were intimated that they did not understand those duties; perhaps they do; if so, it must be confessed many of them have a queer way of showing it.

In filling boilers I have found it a good plan to raise the safety-valve and block it open; this will permit the escape of air, besides indicating the time boilers begin to steam, after which the valve may be lowered. I have observed most stationary engineers in charging furnaces put the kindling wood on the grate bars; another, and I think a better plan, is to first scatter a thin layer of coal all over the bars, atop of the wood; the latter plan, if tried, will be found a more economical and expeditious way in obtaining a good bright steaming fire.

The masonry or setting of externally fired boilers, now almost universally employed in our larger cities where aqueduct water is used, is frequently ruined by heavy forced firing when steam is first got up, the cement and mortar instead of being allowed to set properly, as they would do if slowly and judiciously heated, speedily crumble away, losing the strength of the joint, the brick wall cracks open, the draft is impaired, heat lost, and perhaps the girth seams of the boilers strained by the unequal settling of the walls. In a few months it is necessary to reset the boilers again, for which the innocent mason is cursed loud and deep, the engineer in all probability being his chief accuser. Forced firing is not only injurious to the setting, but to the boiler as well. This is most apparent in the use of the common upright or vertical tubular boiler, in which the water is carried some distance below the top of the tubes; the tube-heads soon begin to leak and require frequent expanding in order to keep them tight. It will be found a good plan when troubled in this way to have defective tubes feruled. Horizontal tubular boilers are often set to return heat over the top of the shell. The disadvantage of this plan of setting is the danger of the exposed shell above water line being injured in getting up steam from cold water; the shorter the boiler the greater the danger of injury, the lower part of the boiler being at a temperature due to that of the contained water, while the upper part is exposed to that of the escaping products of combustion. A recent experience was that of three boilers 42" x 10' used for heating purposes only, at a pressure never exceeding 25 lbs. Yet under these favorable circumstances they were ruined in about five years. More or less trouble had been experienced during the preceding season from leaks above the water line. On examination it was found that the upper half of shell was badly cracked in several places, and when it was attempted to cut out the defective sheets the surrounding metal was found so brittle and badly crystallized the boilers were condemned. The shells below water line had never given any trouble and appeared to have suffered no injury during their brief service. There can be no doubt, I think, that their failure was due to the plan of setting, for they were built by one of our best boiler-makers, of selected iron, and while in service were under the care of a first class engineer. Under less favorable circumstances their failure would have occurred sooner. Fractures in the sheets of boilers set in this way are of common occurrence, the danger increasing with the frequency of getting up sterm.

In some parts of the country local ordinances for smoke prevention are now in force, and many worthless smoke-burning appliances (so called) have been sold to steam users in those localities. A roomy furnace, ample combustion chamber, and a clean, bright, even fire, not exceeding eight inches thick, with systematic firing, will be found helpful in lessening the smoke nuisance. When there is more than one furnace the firing and cleaning must be alternated, the fireman having his tools in reaching distance and damper closed before he opens furnace door, which must be closed again as quick as possible. There are two principal methods of firing, known to the initiated as "spread firing" and "side firing." Each has its advocates, who are convinced theirs is the only plan. I have practiced both, and, so far as I could tell, with about equal results; am inclined to attach greater importance to having an experienced fireman, careful attention, regularity of firing and rapidity of movement, than to any prescribed form of covering the fire, which must of necessity vary in different localities according to the quality of the fuel. But a careful attention to the details enumerated will result in economical consumption of fuel, lessening of smoke, and greatly increased efficiency of the boilers whenever practiced.—F. B. Allen in The Locomotive.

Iron Manipulation.

Iron possesses electrical properties which without its other attributes would be enough to give it rank with the first of the usesul metals. The electro-magnet, on which depends telegraphy and the allied inventions, must as a fundamental part have a core of soft iron which is magnetized and demagnetized as the electric current passes around it or stops. For the construction of all permanent magnets steel is used and nothing else will do. Perhaps the most valuable use of this property is found in the compass, the needle of which is a steel magnet.

Iron is usually shaped to the form desired, by the four operations of casting, forging, rolling and cutting. Wrought iron may be forged, rolled and cut, cast iron may be cast and cut, while steel may be worked by the four methods of casting, forging, rolling and cutting. Forging is hammering the piece of metal into shape while red hot, with hammers ranging in size from the hand hammer of the blacksmith to the enormous one at the Crusot Works in France, of which the head now weighs ninety tons, and the pieces forged have even a greater range in size. Rolling is used to get the metal into plates, bars, rods and shapes, such as rails, which have a constant section throughout their length. It is done by passing the piece of hot iron or steel between strong iron rolls which have grooves cut around them of the shape the metal will take, and. by passing the piece through a series of these grooves; decreasing in size, it is brought down to the shape desired. Enormous power is required for the operation. Cutting is done by the various machine tools found in the machine shop, and almost every metal will find another hard enough to cut it. However, the limit is reached, and a variety of steel is made which can be cut only by the grindstone, but which will cut any other variety yet made. Such in brief are the methods used in the metallurgy of iron, which have been worked and studied out by some of the most powerful intellects of the human race, some by practical experience and some by scientific methods of research. Until quite recently the iron manufacture of the world was solely in the hands of men who learned it by long contact with it, and whose only means of advance was by disconnected experiments which generally failed. It is within 30 years that men possessing other qualifications than that they who had spent their lives in iron works began to study the phenomena presented in iron metallurgy, and in their hands the science has perhaps made more progress than in all the previous history of man. They have had to help them the great advances in physical and chemical science, and the works of Bessemer, Siemens, Bell, Holley, Thomas, and others, are now producing a revolution in the art whereby steel is for most uses replacing wrought, and, in some cases, cast iron.

We are at the dawn of the age of steel. With steel of a half greater strength than for the same weight of wrought iron it is easy to see how great a saving is effected and how much more can be done in engineering. Bridges of one and a half the length of iron ones become possible. Steel steamships of only two-thirds the weight of iron ones of the same size allow the saving to be replaced by freight to the obvious advantage of the owner. But the wearing power of steel is also far ahead of that of iron, and the most striking illustration of this is shown in the universal substitution of steel for iron rails on the railroads of the world. This substitution has been so recent that correct figures are not to be had, but the highest authorities place the life of a steel rail at three times that of an iron one, and the cost is but little greater. Some of this saving goes to the railmaker and some to the railroads, but the great advantage accrues to the general public in the way of reduced freights and fares.—Nashua Telegraph.

RAILROADS AND TRAFFIC.

THE Toledo, Delphos & Burlington railroad company and the Toledo, Cincinnati & St. Louis railroad company having been consolidated, will hereafter be known and operated as the Toledo, Cincinnati & St. Louis railrood company. The offices have been removed to Boston.

THE report recently presented to the stockholders of the Panama Railroad states that the gross earnings in 1881 from all sources amounted to $2,371,369.63, and the total expenses and disbursements of every kind amounted to $1,064,963.60, leaving a net balance of $1,306,406,03.

THE Bellaire, Zanesville & Cincinnati Railroad company has voted to execute a mortgage and issue bonds to the amount of $1,200,000 for the purpose of extending the road from Woodsfield, O., westward. A new survey of the line has been ordered.

IT is thought the New Castle and Oil City company will build a line between New Castle and Youngstown in order to be indepeudent of the Pittsburg & Lake Erie to that point.

THE Cincinnati, Van Wert & Michigan railroad has been extended from the late terminus at Pleasant Point, O., northward two miles to Latty, 15 miles north of Van Wert, and 26 miles from the southern terminus at Shane's Crossing.

AS ONE of the marked outgrowths of last year's progress in the line of railroad development, the Association lines of Southern railway travel, consisting of the Richmond & Danville, the Atlantic Coast Line and the Seaboard Air-Line Railroads, are deserving of notice. Extending through 3,000 miles of the territory of Virginia, North and South Carolina, Georgia, Alabama, Mississippi, Louisiana and Texas, after diverging at Richmond into three distinct routes, these lines are bordered by over one million acres of farm land as fertile as those of the famous Valley of the Red River of the North, that have brought such world-wide renown to Dakota. There is, too, an abundance of growing hard woods on the mountain slopes, while surveys by State authority show vast and diversified mineral deposits that are still practically in an embryo state of development.

THE New York, Chicago and St. Louis railway, between Buffalo and the Illinois Central depot, Chicago, is 521 miles by the measurement of the engineer. In conversation with Chief Engineer Latch, it is learned that the track is now laid from South Chicaco, where the new road joins the Illinois Central, to within five miles of Lorain, O., making a continuous line of 287 miles. From Lorain to Cleveland, twenty-six miles, the line is graded and ready for iron, except the short stretch between Cleveland and Rocky River, which will be finished and the track laid by May 15th. From Cleveland eastward there is now a straight stretch of ninety-six miles of track completed. There is also eight miles of finished track to the east of Brockton. The total number of miles of rail laid to-day is 491, out of a total of 521. Mr. Latcha estimates that the entire line will be completed by May 15th, with the possible exception of ten or twelve miles just west of Buffalo, which will be finished during the first weeks of June. The bridging on the line is practically complete, with the exception of the two great viaducts in this city. The iron work is now on the ground, and the bridges will be completed by about June 15th. The 521 miles of road will have been completed in but a few days over two years from the commencement of construction.—[Cleveland Herald.

THE new management of the Connotton Valley railway fiud it extremely difficult to disentangle the meshes made for them by their former general manager. A few of their bondholders, all of whom are on either the present board of directors, or were there a short time since, have advertised the fact far and wide that they have agreed to their own new scheme for readjustment, or rather assessment. The largest bondholders, however, positively refuse to pay their assessments, contending that $40,000 a mile is enough to pay for an incomplete Ohio narrow-guage road. It looks now as though the road would soon go into the hands of a receiver. The following is a list of bondholders, who have assented to the plan, with amount of bonds held: Counotton Valley bonds—Benjamin S. Rotch, $155,000; William J. Rotch, $155,000; Francis Bartlett, $100,000; Joseph B. Thomas, $100,000; Samuel Watts, $50,000; Albert P. Clark, $50,000; Cyrus Wakefield, $26,000. Straitsville Division bonds—Sidney Bartlett, $201,000; Benjamin S. Rotch, $130,000; William J. Rotch, $100,000; Francis Bartlett, $83,000; Joseph B. Thomas, $70,000; Cyrus Wakefield, $25,000; Samuel Watts $17,000; Albert P. Clark, $11,000. One of the directors subscribes for an additional $125,000 of the new 6 per cent. bonds.

MECHANICAL RECEIPTS AND ITEMS.

A New Method of Moulding to Size.

A correspondent of the *Mechanical Engineer* writes: It is highly desirable in many cast objects of circular section, that they should be cast so accurately to form and dimension as not to require subsequent finishing. But finishing is generally needed; largely by reason of inspections of the sand mould as to form, and the "rapping" of the pattern to remove it from the mould. This last makes the mould larger than the pattern, but not uniformly so in all moulds, nor even in different diameters of the same mould. Another cause of non uniformity is that the venting is unequal in different moulds, and also in different parts of the same mould; the pressure of the liquid metal enlarging it. By a system of moulding recently shown at the Franklin Institute, Philadelphia, the pattern is drawn by a guiding mechanism through a closely-fitting guide-plate; and the venting is done by having channels in the flask, through which venting needles are passed, and which the rammer cannot reach. These channels are therefore filled with loose sand; the adjacent sand being tightly packed. The core rests entirely on the lower part or bottom of the mould, so that the accuracy of centering does not depend on the fitting of the flask, as it usually does. Balls thus moulded and true within 1-100th of an inch, can be used without dressing to draw lap-welded tubes over; saving first cost in labor and material and having a more durable surface than if ground or turned.

Tempering Steel.

Perhaps one of the best methods ever introduced for tempering steel is that employed in hardening the blades of the famous Damascus swords. The furnace in which the blades are heated is provided with a horizontal slit through which a current of cold air from the outside is allowed to enter. This slit is placed on the north side of the furnace and has an exterior flat tunnel shaped attachment by which the wind is concentrated and conducted into it. The operation of tempering is, as a rule, performed only on those days of winter when a strong north wind prevails, the red-hot blade being lifted out of the fire and gradually cooled in the current of air issuing from the slit. The proper degree of temper is thus often acquired by a single operation.

Expansion of Steel in Hardening.

It is well known to workers in steel that by the process of hardening it is sometimes expanded, so that a job where two pieces fitted accurately in their unhardened state become so much enlarged that grinding is necessary to restore them to their former relative size. No rule has yet been found by which the amount of this expansion can be actually determined before hardening. It may depend upon the amount of carbon in the steel, which varies in different specimens; on the degree of heat employed in the process; and also largely on the size and shape of the pieces treated. This expansion may, however, be reduced to the minimum by repeated annealings while the work is in progress at the lathe, vice or planer. It is also true that in some instances steel, having been hardened, will contract slightly when drawn to temper, the amount of contraction depending on the lowness of drawing.

Metalline.

The compacted material known as metalline is destined, it is believed, to effect a great revolution in both heavy and light bearings. Its moderate strength requires that for heavy work it should be supported by metal; it is introduced in the form of plugs thickly distributed on the bearing surfaces. The U. S. Government has recently ordered this material to be applied in five thousand bearings. It called for two millions of plugs. An improvement is in progress which will allow oil to be used with it.

Annealing Steel.

A correspondent of the *Blacksmith and Wheelwright* writes: I take a good sized iron kettle or box and fill it half full of dry air slacked lime that is very fine. I then heat my steel to a nice cherry red and place it in the centre of the kettle and fill it to the top with the lime, pounding it down as solid as I can. I leave the steel in this position until it gets perfectly cold. I have tried several plans for accomplishing the same results, but like this the best.

Kaolin for Locomotive Boiler Covering.

To apply kaolin as a boiler covering—kaolin being a species of very greasy clay found in large quantities in Aiken, S. C., a ring is set edgewise at the front end of the boiler. This ring is made in two sections of $\frac{1}{4}$x1$\frac{1}{2}$-in. iron, and bolted together top and bottom. Strips of wood 1$\frac{1}{2}$x4 in. are placed lengthwise of the boiler at the centers on the top and bottom, to which the jackets are to be fastened. The strips under the boiler have the inside corners cut out $\frac{3}{4}$ in. deep and $\frac{3}{4}$ in. wide to form recesses to hold the cement to the boiler while it is hardening. These strips are held in place by five or six $\frac{3}{4}$-in bands of hoop iron around the boiler. Lead has been used instead of wood; but as these wooden strips are secluded from the air, it is thought they will last a long time before they are spoiled by charring.

Repairing the Sarven Wheel.

There are so many imitations and new manufacturers of Sarven wheels that it is a matter of some difficulty to determine the trouble with the wheels not knowing the manufacturer. There are many cheap Sarven wheels that are of no account. If they are from a good maker we should judge that the tires were set upon the wheels too tight. In putting tires upon the plain or wooden hub wheel, it is necessary to have the tires very tight, to keep them in place in the hub, but it is not so with the Sarven wheel. They are firmly fastened in the hub, therefore do not require that draft of tire that other wheels do. Judgment should be used in drafting the wheel before setting the tire. Only enough of the rim should be cut out to have it set solid on the shoulders of the spokes, and prevent the wheel from being rim bound. In repairing the Sarven wheel cut off the rivet nearest the spoke to be taken out and remove it. Then draw or mortise out the spoke, not disturbing the bands or flanges. Drive a new spoke in place of the one taken out: bore a hole through it even with the hole in the flange; put rivet in, and rivet it very tight.

Coke.

A phenomenal feature of the present progress of our coal interest, is the great investment of capital in lands underlaid with good coking coal, and in their development. Colliery owners whose coal is of the proper quality, and who have the facilities for converting it into a good hard coke, suitable for blast furnace and other purposes, where great heat is required, have enjoyed an exceptional degree of prosperity for several years back and must continue to do so, as long as the demand for iron continues as great as it is, or until so many openings are made, and so many ovens erected, that competition overcrowds the market and breaks prices. This is very likely before long to be the result of the present rush into the mining of coking coal, even though the iron trade should continue prosperous, as the openings and necessary plant for making coke can be quickly made and erected, if the money, which is now entering the business so rapidly, is only at hand. As every other class of American colliery owners, the coke men are soon likely to be compelled to meet the question of over-production and to consider plans of restriction.

Practically the area of good coking coal territory is unlimited. If it were confined to the Connellsville, Pa., and West Virginia districts there is room for a wonderful development and an immense production. But suitable coals are being found in other sections of the country. And many coals which are not exactly suitable in their natural state, are made so by breaking and washing. Coke suitable for furnace work must possess a certain density. In blast furnaces there are practically two zones of combustion—one at the tuyeres and another at the top. The gaseous matter produced in combustion acting on the oxide of iron generates carbonic acid which attacks the carbon in the upper zone, and the softer and more friable the coke, the easier it is attacked and consumed. Impurities that detract from the value of coal for coking purposes are slate and clay, which become mixed with it in handling, and sulphur. The latter is met with most frequently as sulphate of iron or iron pyrites, and as sulphate of lime or gypsum in either form, if present to any considerable degree, will render the coal and to a still greater extent the coke made from it, unfit for iron manufacturing, as there will be at least 50 per cent. more ash and sulphur in the coke than in the raw coal from which it is made. The less ash and sulphur the better. In the furnace the ash must be heated to the melting point, and as it is composed of refractory substances its absorption of carbon is great. The more ash, the more fuel lost in reducing it, while owing to its presence the slag or cinder is less liquid and more likely to cling to the sides of the furnace. Fuel containing much sulphur makes a white and inferior iron, while with the same ore and flux with a pure fuel a good iron can be made. Machinery for removing clay, slate and sulphur by crushing and then washing has been perfected lately in Great Britain by Mr. Shepperd, of Bridgend, South Wales, and here by Mr. S. Stutz, of Pittsburgh, which has enabled the utilization of deposits of coal for the manufacture of good coke, which, had not the raw coal been crushed and washed, must have been of very inferior quality. As with everything else this apparatus will be improved in time, advancing the grade of the coke from all the coals treated by it, and making it possible to coke the product of seams that at present cannot be so used. This will greatly enlarge the field of the profitable manufacture of coke. While it will create competition and incite to over-production, the great draw-back to every other branch of coal mining, it will still farther enhance the coke interest, which is so rapidly assuming mammoth proportions.—*Mining Herald.*

MISCELLANEOUS RECEIPTS.

AQUEOUS SHELLAC VARNISH.—A varnish for covering maps, photographic prints, etc.. can be readily prepared, by merely shaking together two parts of a saturated solution of borax and one part of pulverized shellac, applying no heat. Solution will be effected in two or three days. In three parts, however, the shellac is easily soluble, Bleached shellac must be preserved under water, and must be dissolved immediately after being powdered; for if the powder be exposed to the air for several days it will be dissolved only with great difficulty, and perhaps not at all. If in preparing the varnish a higher temperature than fifty or sixty degrees C. is employed, the liquid is apt to assume a faint reddish color; the finished varnish, however, bears heat very well. Now this varnish may not only be used for rendering pictures, prints, maps, etc., glossy, but it forms an excellent starch gloss. In fact this varnish will be found much more adapted for laundry purposes than any of the starch glosses found in commerce.

CEMENT FOR LEATHER.—Virgin gutta percha, 2 drachms; bisulphate of carbon, 2 troy ounces. Dissolve. This cement is the article used for patching shoes. The patches are made of thin leather or kid, and are sometimes known by the name of invisible patches.

PRESERVATIVE PAPER.—Two new kinds of preservative paper have lately come into commerce. One is produced by dipping soft paper in a bath of salicylic acid and then drying. The bath is prepared by mixing a strong solution of the acid in alcohol with much water. The paper is useful for covering apples, etc. The other paper, meant to preserve from moths and mildew, consists of of so-called manilla packing paper dipped in a bath and dried over heated rollers. The bath is formed of 70 parts spirit of tar, five parts raw carbolic acid (containing about a half of phenol), 20 parts coal tar at 160° Fah., and five parts refined petroleum.

IMITATION OF STAINED GLASS.—The process consists in taking a pattern made of oiled linen upon which the design is stamped in beautiful colors, placing it upon the glass, and then applying chemicals by which the design in all its perfection is transferred to the glass. The pattern is then removed and leaves the glass as beautifully and delicately stained as if the artist had left his masterpiece there. By this process the staining is quite as durable as if done in the old and expensive way.

TO IMPROVE GUM.—A little glycerine added to gum or glue is a great improvement, as it prevents either becoming brittle. It also prevents gummed labels from having a tendency to curl up when being written on.

A QUICK WAY TO CLEAN SCALES.—Turn in a pan enough water of ammonia to cover the bottom, and use a few handfuls of dry pine saw-dust or pine chips as they come from the planer, rubbing briskly until the pan is dry. They will be then cleaned and polished.

FACTS

For Machinists, Manufacturers and Others.

Machine-Made Horse-Shoe Nails.—The manufacture of horse-shoe nails by machinery has, after continuous experiments, made with commendable and unflinching perseverance, been so successfully accomplished that an important industry in this line has been established at a number of places in this country, and machine-made horse shoe nails will doubtless in time supersede all others. Machines for the purpose were invented upwards of forty years ago, but these contrivances failed, one after another, to turn out nails possessing that firmness of texture and durability which are the acknowledged features of the nail hammered out of an ordinary nailrod by hand, but this difficulty, with that of suitable material, such as would adapt itself to the requirements of the machinery and produce a thoroughly reliable nail, is now found in certain qualities of steel. This country has long enjoyed an almost complete monopoly in machine-made horse-shoe nails. It is to be regretted, however, that some makers of machine made horse-nails who use large quantities of this metal, partially destroy its nature during its conversion into nails by subjecting it to very heavy pressure whilst cold, in order to stiffen the nail. It has been aptly remarked that "a horse-shoe nail, though required to be of a certain stiffness for driving, should nevertheless be capable of being easily bent by the fingers." Makers of machine made nails have had to contend against a serious disadvantage, arising from the cost of keeping very fine machinery in repair. Some of the appliances which have to do heavy work are of no greater thickness than "the back of an ordinary table knife." The steel bars are first rolled to a special section. These bars are then placed in a large pickling-vat containing a solution which effectually removes the scale which is induced by rolling. After immersion for a few hours the bars, which run from 16 feet to 18 feet long, are fed into a cutting-up machine, which is self-acting and continuous in its action. From this machine upwards of 100 nails per minute fall, the nails being delivered from the side of the machine into a box. By these means the whole bar is cut up automatically, all but a short end, when the machine ceases cutting. The nails are now ready for the second mechanical operation, which consists in passing them through a special rolling machine, which, at the same time that it puts a good square face and finish on the nail, tempers it to a correct stiffness for driving without destroying the quality of the metal. They are then placed in a special furnace, where they are kept at a blood red heat for a fixed time, the air being perfectly excluded from the nails, whereby all scaling of their surfaces is prevented, the nails coming out a fine black color, which materially prevents them from rusting afterwards. The next and most important operation is pointing them ready for driving. This is effected without clipping the points, which is the method usually adopted in most machine-made nails, by a slight but exceedingly rapid hammering action, which makes a sharp, clean point without the burr often found on clipped points. The nails are now finished and fit for the market, being bright or black as desired, and pointed ready for driving.

A New Screw.—A new screw has been brought out which promises to have an important place in the market in the near future, and which the established companies feel a natural interest in discouraging. It is a well-known fact that the great bulk of the screws used are set in with the hammer, and given a turn or two with the screwdriver to bring them flush. Recognizing this fact, an ingenious inventor, for many years somewhat prominently identified with the business, has brought out a new screw, which is adapted for driving, and which enters the wood without tearing the grain. The gimlet point is dispensed with, and a cone point substituted. The thread has such a pitch that it drives in barb fashion, offering no resistance in entering, but firmly resisting all attempts to withdraw it except by turning it out with the screwdriver. The head is flat, but in setting it up two nipples or square shouldered projections are raised in it by the one operation. The screwdriver takes hold of them more easily than it does of the customary nick, and holds quite as firmly, and when driven flush the projections on the head are not in the way, and do not disfigure it. It is claimed that this screw can be made one-third cheaper than ordinary screws, the principal saving being effected in doing away with the necessity for sawing the nick in the head. This consumes more time than any other one item of the manufacture, and is very destructive of saws, which are expensive and have to be kept on hand in large quantities. This new screw is intended for all kinds of cheap work, and is said to be very favorably regarded by consumers on account of the low price at which it can be sold, as well as because it is adapted to be used legitimately in a way in which the great bulk of the screws consumed are used illegitimately. It is probably the most important hardware novelty which has been brought out for some years.

Mistakes.—"Mistakes," as they are called, says the London (Eng) *Mechanical World*, are generally the result of carelessness or ignorance, and are a prolific source of "accident" when they occur in an engineering establishment. The mischief is they are frequently more easily made than detected, and hence their discovery and the legal necessity to hold a coroner's inquest arise too often at the same time. We imagine that carelessness and ignorance joined in the production of the mounting of a safety-valve some years ago. This was fitted to a boiler which soon after exploded from some "mysterious" cause, and caused death and injury to several "individuals". No explanation of this accident was ever made public, but we learn from the best authority that an engineer walking over the ruins shortly afterwards came across the casting on which the valve seating was formed. This was broken, and the fracture revealed to him the fact that there was no communication between the valve and the interior of the boiler. The pressage, as designed, was curved, and the core had broken in the mould, thus allowing the metal to occupy a portion of its space, and form a steam-tight partition in the bend, where it could not be seen from either end. Gross as this mistake was it had ultimately a doubly beneficial result, for it set the engineer thinking. The outcome of his cogitation was one of the best known safety valves of past years, which for a long time had no rival. Thus the public benefited, while the engineer kept his counsel and made his fortune. The cause of this "accident"—the breaking of a curbed core in the mould—has frequently been overlooked, and should always be sought by testing such passages. This we know is usually done, but it is not long since several engineers met in solemn council over an obstinate large new engine, constructed by a well known firm. This engine steadily refused to make more than half a revolution, the various solutions were propounded and long and animated discussions ensued. For three days they tinkered at the engine, and grew more desperate, at length a fitter's apprentice volunteered the suggestion that one of the S cores had given away, and that therefore there was only one effective port instead of two. This was found to be the case, and the obstruction being removed "all went merry as a marriage bell."

The Rights of Express Companies.—The form of the final decree to be entered in the cases of the express companies against the railroad companies was approved at St. Louis on March 24th, by Judges McCrary and Treat, in the United States Circuit Court. It is a sweeping injunction, providing for the carrying of express matter in charge of a messenger or agent on all passenger trains. The railroad companies cannot open or inspect the packages, or demand a knowledge of their contents. Railroad officials are not allowed to interfere in any way with express matter or messengers. The express companies are to keep an account of their carrying service, and make a settlement on the 15th of each month for the business of the month preceding. The rate is to be not exceeding 50 per cent. more than the prescribed rates for the transportation of ordinary freight, and not exceeding the rate charged by the railroad company for any other express company. All previous excesses in rates or unjust discriminations are to be investigated by the Master in Chancery. The injunction is perpetual.

Patching Boilers.—When a boiler requires patching it is better to cut out the defective sheets and rivet in a new one, or if this cannot be done a new piece large enough to cover the defect in the old sheet may be riveted over the hole from which the defective portion has been cut out. If this occurs in any portion of the boiler subject to the action of the fire, the lap should be the same as the edges of the boiler seams, and should be carefully calked around the edges after riveting. Whenever blisters occur in a plate, patching is a comparatively simple thing as against the repairs of a plate worn by corrosion In the latter case the defective portions of the plate should be entirely removed and the openings should show sound metal all around, and of full thickness. If this cannot be obtained within a reasonable sized opening then the whole plate should be removed.

Ores for Steel.—Metallurgists are not as yet agreed as to what is the most desirable and serviceable chemical combination for a steel rail. Continuous experiments and observations have been made with a view of determining this result. There is danger of a rail being too soft or too hard. If too soft, it wears away too fast; if too hard, it is liable to fracture. The basic process, with which the names of Reese in America and Gilchrist and Thomas in England are so intimately connected, has brought into requisition a large body of ores heretofore of very inferior value because of the presence in them of a large percentage of phosphorous, which no process prior to the one named could remove. Two causes have operated to impede the adoption of that process in this country. First, the high quality of American ores renders dependence on foreign ore and pig more limited; and, second, the urgency of requirements for immediate wants in railway construction has demanded the entire attention of steel rail manufacturers. The demand for Bessemer ores and pig is stimulating mining and manufacturing enterprise in that direction. Virginia ore fields have opened up hopes for abundant supplies, but the efforts of investors, experts, blast furnace managers and others who have gone thither have not been attended with the promised success, except in a few marked instances.—*Bradstreet's.*

Qualities of a Good Cover for Steam Engines.—A coating of this kind to be valuable must be impervious to air and moisture, and must have consistency and body enough to completely cover the surface to be protected. It must be pliant and elastic, so as to expand and contract with the metal under various temperatures, without breaking, cracking or checking. It must be adhesive, and of such an adhesive nature that its expansion and contraction will not cause the same to separate its contact with, and adhesion to the metal surface. It must be pliable, capable of drying readily, and of easy removal when so desired. It must be non-corroding.

Ohio Agriculture.—The April report of the Ohio State Board of Agriculture, based on 1,100 township reports, gives the following figures compared with the same time last year: Wheat—Probable bushels of coming crop, 35,612,190, as against 37,581.094 for last year. Bushels old wheat in producer's hands. 7,413 698. Rye—Acreage, 94; condition, 101. Barley—Acreage, 99; condition, 100. Clover—Acreage, 95; condition, 83. Cows—Number, 95; condition, 98. Other cattle—Number, 88; condition, 91. Horses—Number, 90; condition, 96. Sheep—Number, 99; condition, 101. Hogs—Number, 83; condition, 92. The general wages of farm hands is $16.70 per month, with board, and $25 without board.

Items.—Re-heating and rolling down or forging down wrought iron bars reduce their elongation and increase their tensile strength. The skin of wrought iron is *not* the strongest portion. Cold rolling increases the strength of wrought iron. Tensile strength of wrought iron averages 10 per cent. more with the fibre than across it. Compressing melted steel with a pressure of about six tons per square inch increases its strength, The shearing strength of steel averages 72 per cent. of its tensile strength. Steam expanded from the initial volume, 1, 2, 4, 8, 16, volumes, will give out work in the proportions of 1, 1.693, 2.386, 3.079, 3.772. A good rivet, cold, should bend double without breaking. The head should flatten out, when hammered hot, to $\frac{1}{3}$ inch thick without fraying at the edge, or breaking. Boiler plates should be caulked with a convex tool.—*Dr. Robert Grimshaw.*

The first horse railroad was built in 1826-7.

TRADE AND COMMERCE.

Our Foreign Commerce.

More than half the foreign commerce of the United States during the last fiscal year was conducted with Great Britian and her colonial and other possessions. Great Britian and Ireland received 53 32 per cent. of the total value of our exports of domestic merchandise. Our total foreign commerce, counting imports and exports with France amounted to $164,003,826; with Germany, $123,177,433; with the West Indies, $114,249,241; with the British North American provinces, $77,554,823; with Brazil, $62,034,951; with Belgium, $48,929,766; with China, including Hong Kong, $33,028,091; with the Netherlands, $32,154,813. While commercial intercourse was conducted in all other important directions there was no country with which it was of sufficient importance to gain relative rank equal to two per cent of the total foreign commerce. The total value of the imports and exports of merchandise during the fiscal year ended June 30th, 1881, at the leading American ports was as follows: Baltimore imports, $16,189,816, domestic exports, $72.444,413, foreign exports, $27,280; Boston and Charlestown, Massachusetts, imports, $61,960,103, domestic exports $72.100,193, foreign exports, $1,333,484; New Orleans, imports, $12,213,920, domestic exports, $103,540,548, foreign exports, $213,538; New York, imports, $435,450,905, domestic exports, $393,658,208, foreign exports, $13,522,816; Philadelphia, imports, $32,583,106, domestic exports, $44.147,296, foreign exports, $82,409; San Francisco, imports, $37,943,695, domestic exports, $34,412,580, foreign exports, $684,276.

Proposed New Steamship Line.

Sea captains, who base their opinions upon many years of experience, say that the American trade has sufficiently developed within two years time to call for the establishment for a regular line of packets between New York and the Cape of Good Hope Colonies, which is a striking evidence of progress when it is remembered that as late as 1877 ships went to the Cape only when specially chartered. American imports are chiefly confined to wool, ivory, feathers and wine. The latter comes principally from Cape Town, which has been an extensive wine growing district for years. The varieties of the wine are pentak, sherry and constantia, the latter being somewhat of a novelty in America, though well known and liked in England. No doubt our Ohio and California wines would secure a good sale were the line established.

The Thermo Electric Battery.—Heat being power, we may very possibly learn to transmute it economically into the more available form of electricity. One method of transformation we already possess, and we have every reason to believe that there are others yet to be discovered. We know that when dissimilar metals are joined at opposite ends, and heated at one set of junctions while they are cooled at the other, part of the heat applied disappears in the process, and assumes the form of an electric current. Each couple of metals may be treated as the cell of a voltaic battery, and we may multiply them to any extent, and group them in series or in parallels, with the same results as are obtained by similar combinations of voltaic cells. The electricity so produced we term thermo-electricity, and the apparatus by which the current is evolved is the thermo-electric battery. At present this apparatus is even more wasteful of heat than the steam engine; but considering the very recent origin of this branch of electrical science, and our extremely imperfect knowledge of the actions involved, we may reasonably regard the present thermo electric battery as the infant condition of a discovery, which, if it follows the rule of all previous discoveries in electricity, only requires time to develop into great practical importance.

There are other canals talked of besides the Hennepin canal. One is designed to provide a short cut across the State of Michigan, probably from Saugatuck to Detroit, a distance of 178 miles. The proposed course of the canal is along the Kalamazoo river to its head, thence eastward. The number of locks required would be 22. Another line is also talked of, running from a point near Chicago through Northern Indiana and Ohio to Toledo. The estimated cost of a canal along the first described line is about $5,555,000

ITEMS OF INTEREST.

The first iron steamship was built in 1830.

Ships were first "copper-bottomed" in 1783.

The first saw-maker's anvil was brought to America in 1819.

The first use of a locomotive in this country was in 1829.

Most of the coal for the lakes is being loaded at Cleveland as yet.

The first American copper cent was coined in New Haven in 1687.

Italians are importing not only mosaics into New York, but also tiles from Venice.

Glass was early discovered. Glass beads are found on mummies over 3,000 years old.

Gas was first used as an illuminating agent in 1702. Its first use in New York was in 1827.

The Columbus, Hocking Valley and Toledo railroad are hauling about 500 cars of coal per day.

The St. Louis Bridge Company and the St. Louis Bridge and Tunnel Company pay taxes on over $700,000.

The Swiss are to have a great exposition in 1883, at Zurich, of ceramics, pottery, earth pipes, pottery ware, stoves, brick and tiles, and cement.

Speaking after the manner of proverbs, good American hogs, mostly of the Western brand, when they die can now go to Paris.—*Boston Commercial Bulletin.*

The demand for barbed fencing wire is greatly on the increase in New Zealand, America being at present the chief source of supply. A small quantity manufactured in Canada, and recently imported into the colony, was readily taken up.

One million standard silver dollars weigh 412,500,000 grains, or 859.375 ounces troy, or 71,614.58 pounds troy, or 58.928.57 pounds avoirdupois, or 29,464-1,000 "short" tons of 2,000 pounds avoirdupois each, or 26,307-1,000 "long" tons of 2,240 pounds avoirdupois each.

A European journal says: Upon the Balachanskio Railway, the Crimea, Russia, the locomotives are heated with crude naphtha, which is introduced into the tender as it comes from the wells, and there have been no accidents resulting from its use.

So microscopically perfect is the watchmaking machinery now in use that screws are cut with nearly 600 threads to the inch—though the finest in the watch has 250. These threads are invisible to the naked eye, and it takes 144,000 of the screws to weigh a pound, their value being six pounds of pure gold.

One million standard gold dollars weigh 25.800,900 grains. or 53.750 ounces troy, or 4.479 1-6 pounds troy, of 5,760 grains each, or 3,685.71 pounds avoirdupois of 7,000 grains each, or 1,843-1,000 "short" tons of 2,000 pounds avoirdupois each, or 1 645-1.000 "long" tons of 2,200 pounds avoirdupois each.

There are fifty-six cotton seed mills in the United States, most of them in the Southwest. These mills use yearly about 400,000 tons of seed, which, after being cleansed from lint and husks, and chopped fine, are packed in woolen bags, placed between horsehair mats, and submitted to hydraulic pressure. The oil is either barreled at once or treated with caustic soda, yielding about 82 per cent. of purified or "fine" oil. The total yield is about 15,000,000 gallons annually, of which, it is stated, about 10,000,000 gallons are sent to France, and there mixed with about one-third of olive oil. This mixture is then shipped from France to all parts of the world.

The remarkable development of the export trade in Swedish matches is noted by Mr. Drummond Hay, British Consul at Stockholm. About 19,000,000 pounds avoirdupois were shipped during 1880. One manufactory alone, which is stated to be fast gaining a world wide celebrity for the quality combined with cheapness of its products, employs 872 hands, of which 339 are women. This factory was originally started on a very small scale in 1845. The precautions adopted against fire are said to be so efficient that the buildings are insured for comparatively low premiums.

The *Inter Ocean* states that there are 750,000 more tons of iron ore, 300,000 tons more of coal, 500,000,000 more feet of lumber for lake shipment this season than last.

A comparatively new method of heating railway cars, called the Grayden Safety Car Heating Apparatus, is now in used on a number of the Southern roads. Surplus steam from the locomotive is used. The advantages claimed are perfect safety, a uniform degree of heat throughout the whole train, great economy and simplicity of operation.

There is now being constructed at Sacramento, Cal., for the Southern Pacific Railroad Company, one of the heaviest and most powerful locomotives in the country. It will weigh when in running order sixty tons, and the tender, with coal and water on board, thirty tons more. It is designed to draw twelve loaded cars over the heavy grade of Tehatchpi Pass, and will run only between Caliente and Mojave, a distance of 45 miles.

How nickel got its name happened in this wise. On being found in different parts of Germany it was supposed to be allied to copper, and given the name of false copper. When a scientific chemist of the name of Cronstedt examined it in 1750, and discovered its true character, he struck out the word false. Nickel is rather a scarce mineral and always found combined with other metals as iron, arsenic, copper, cobalt and bismuth.

The Pullman Palace Car Company has recently placed upon the Pennsylvania Railroad a hunting car specially constructed for the uses of huntsmen desirous of reaching their destination without suffering the inconveniences incident to such excursions. The car, which resembles an ordinary baggage car in outward appearance, is fitted up with conveniences for dogs, baggage, and other sporting paraphernalia, while a portion has been partitioned off for sleeping apartments, cooking, and other homelike comforts for the hunters. The kennels set apart for the dogs are arranged in tiers around the sides of the car, and they have been built with a view of giving the best possible conveniences to the occupants.

REVIEWS.

President Garfield's Works. The publication of the authorized edition of the works of President Garfield has been entrusted to Messrs. James R. Osgood & Co. of Boston. It will be carefully prepared and edited by President B. A. Hinsdale, of Hiram College, Ohio, the life-long friend of Gen. Garfield, who was thoroughly familiar with the late President's habits and method of thought. The work will be in two octavo volumes, from new and clear type, printed in the best style of the University Press of Cambridge, and handsomely and substantially bound. It will contain new portraits of President Garfield. The work is expected to be ready for publication in November next.

Demorest's Monthly Magazine for April. Edited by M. and Mme. Demorest and Jennie June. New York: 17 East 14th street.

Demorest's Monthly Magazine holds the first rank as a fashion magazine, and is unapproachable in variety and excellence of contents as a family journal. Great as has been its achievements in the past, the series for the present year have never been excelled in illustrations and attractions. Each has had one or two superb page pictures in oil, with large steel engravings in addition to the many in the body of the magazine. The frontispiece for April has an array of choice flowers in oil, followed by a full page engraving of "Lost Happiness," and this by another, "The Infant Moses," exquisitely engraved. In addition to the exhibits of coming fashions are stories, sketches and poems of a high order. A premium in pictures, books, etc., is offered to each subscriber.

Artificial Stone.—In the report on the Exhibition of Applied Science, Paris, 1879, the articles of artificial stone, by M. Dumesnil were referred to. This substance is composed as follows: In 500 litres (110 gals.) of water are dissolved 7 kilos (15½ lbs.) of alum, 6 kilos (13¼ lbs.) of slaked lime, and 1 kilo (2¼ lbs.) of yellow ochre, to which add 1 kilo of glue dissolved in litres (1 gal.) of hot water.

MINES AND MINING.

MINING began in Utah in 1870. The output has been fifty six million dollars, lead, silver, and gold. The yearly product averages six million dollars. The mining area is coextensive with the mountains. Mines have been found in every county. There are eighty mining districts, embracing five million acres. Many are now abandoned, but with better facilities of intercommunication and more experience in reducing ores they will be revisited and work resumed, not again to cease.

THE new mine of the Excelsior Coal Company, Wadsworth, O., is putting out 400 to 500 tons daily. This mine has been opened in one of the finest pieces of coal in the Tuscarawas Valley, averaging about five feet of clear coal. They have about 300 acres in the tract. Large chutes have been erected and fine hoisting machinery has been put in place, enabling them to hoist the coal with dispatch.

THE Leadville Consolidated, of Carbonate hill, Col., is doing very nicely and shipping about three hundred tons of ore a month. The ore is of good grade and the mine earning handsome profits. Another dividend has been declared, of twenty thousand dollars, which is payable on the first day of April. This makes a total of dividends of $190,000.

THERE is a fine field in Douglas County (near the head of Lake Superior), says the *Superior Times*, to explore for copper. The entire South Range, which passes only eight miles from Superior, is composed of trap rock, carrying numerous large and well-defined copper veins. Nuggets of native copper, weighing from one ounce to several pounds, have frequently been taken out. It is a wonder that some one is not looking up the copper interest.

Two or more shafts at the Calumet and Hecla Mining Co. (Lake Superior) have attained a depth of 2,700 on the dip of the conglomerate. The bottoms of these shafts are as rich today as ever they were, and during the past year the company has put in very expensive and ponderous machinery, calculated to suffice for years to come, and thousands of feet deeper, thus evincing what its officers think of the probabilities of their mine holding out in depth

THE State of Sonora, Mexico, has now upwards of five hundred Americans within its borders, delving for the precious metals, backed by no less than thirty companies, many of them with large capitals to sustain them; notably, the Santa Maria on the Sonora river. The Stewart party met and passed upwards of eighty eight mule teams and near two hundred small outfits on the road to Baquatche, Arispe, Sonora River, Cumpas and Opposura. Machinery for hoisting works, pumping, stamping and smelting to are be seen at all points. On the Sonora river within a few miles of each other are four smelters with hoisters and other requisite machinery now going up. But it is to the great railroad enterprise now being so energetically pushed, that Sonora must look for her full and quick development. The great want of wagon roads, has almost isolated her, as a mining centre, and rendered her to the mining world a "*terra incognita.*" But she is fast coming under the control of American energy, and American enterprise.—*Cor. N. Y. Mining Record.*

SCIENCE AND INVENTION.

ELECTRIC INDICATOR FOR STEAM BOILERS.—D. J. Cable of Pittsburgh has invented a combination if a graduated indicator case provided with a glass door and with a loose or free index. The indicator case is insulated and the free index moves up or down as the water in the boiler, being so arranged that it makes a continuous current, ringing a bell if the water is too high or too low.

NEW SAFETY LAMP.—A new safety lamp has been constructed by Dr. Schondroff, which can only be opened with the help of a strong magnet. A lever presses against a toothed wheel, which allows or prevents the movement of the screw fastening the glass door holder to the socket. The lever must be moved in order to open the lamp, and this is done by means of a strong magnet.

CASTING IRON FROM THE FURNACE.—An English inventor has patented a mold for casting pigs of iron from the furnace. It is of iron, and heated before using to prevent chill, and is said to produce pi6 of mosa uniform quality than when the metal is csst in the sand, and besides, the mold may be provided with ribs across the bottom, thus making divisions on which they may be readily broken.

NEW SIGNALLING INSTRUMENT.—Adjutant -Major Gaumet of the 27th Regiment of France, has invented an instrument called the Telelonge for signalling from a distance. As experience show that familiar objects are the most easily distinguished, the signals consist of the letters of the alphabet and figures, which are silvered on a dead-black ground, and illuminated at night by lamps aad strong reflectors. A powerful telescope alone constitutes the receiving instrument. For signalling to a distance of two and a half miles. the whole apparatus weighs under five pounds; and with a more powerful telescope signals can be distinguished eight miles, and even further in a clear atmosphere.

IMPROVED APPLICATION OF NICKEL.—It has hitherto been impossible to use the simple acid salts of nickel, because they often give rise, under the influence of the electric current, to a gray or black deposit, which is not adhesive, instead of the true metallic deposit. This would appear to result from the formation of a sub-oxide, a sub-chlorate, or other sub salt, which accompanies the metal. It has been found that by adding benzoic acid to the saline solutions of nickel, this tendency towards an imperfect deposit is corrected. It is therefore, no longer necessary to employ chemically pure products, as all impurities contained in the salt of commerce are completely neutralized by this method.

PISTON PACKING.—A spring packing for piston heads, consisting of one or more split rings backed by a spring composed of a strip of fluted or corrugated metal and an adjacent strip of plane plain metal coiled together, has been patented by John Booth, Detroit, Mich.

THE United States Mint at Philadelphia, is receiving ten tons of gold a week of melted foreign coin valued at $5,000,000.

INSTANTANEOUS photography is becoming marvelously minute in its effects, An Englishman has photographed a swallow on the wing and fixed the bird's shadow on the water perfectly.

MARKETS.

FINANCIAL.

Office of TRADE REVIEW AND WESTERN MACHINIST.

FRIDAY EVENING, April 14.

There has been a good demand for money, and a considerable outflow of currency to the country. Rates of discount are 7@8 per cent. Requirements for Eastern exchange for mercantile purposes are light.

NEW YORK.—The stock market, after rising to higher figures, was met by such a liberal supply of stocks as to cause a reaction. Still there has been a general gain over the quotations of last week. Much depends upon the action of leading speculators At last advices the market was irregular. The business in railroad bonds has not been large, and has been confined to a small number of issues.

IRON.

The spring trade in iron has not come up to previously existing anticipations. Makers of standard brands are fully engaged on back orders. Sales of foundry, with the exception of the best brands, are generally effected at prices somewhat lower than quotations. There is no effort on the part of producers to force sales, sellers realizing the fact that such action would exercise a depressing influence. In Scotch iron there have been moderate transactions. We quote: Eglinton, $23@23.50; Carnbroe and Glengarnock, $24.50@$25; Coltness and Langloan, $26 26.25; and Gartsherrie, $25 50 The demand is good for steel rails; summer deliveries are hard to get. For scrap the market is quiet. No. 1 wrought is quoted at $31 to $33 per ton, the outside figure for selected railway; car springs and axles $38 to $40; wrought turnings $23 to $25; old car wheels nominal at $29 to $30, gross, cast borings $16 to $17. On several descriptions of wrought iron discounts have been reduced; we quote at 60 to 60¼ per cent. off on gas and steam pipes, and 42½ to 45 per cent. on boiler tubes. Oil well casing 67 1-2 cents per foot; do., tubing, 20 cents. Constructive iron fairly active in all branches.

CINCINNATI--(Reported by Rogers, Brown & Co) The demand for pig iron improved but little during the week. Some round lots of forge iron were sold at about the equal of $22 to $23, cash, in Cincinnati. Sales of foundry iron were confined to carload lots with occasional transactions of 50 to 100 tons. The large number of consumers making inquiries with reference to a purchase, "when the bottom is reached," suggests a condition of things that would quickly bring about an active trade, if it could be settled that prices would go no lower. Stocks, both at furnaces and in the hands of consumers, are very light. The elements in the situation in the buyers' favor are a slight slackening in the demand for manufactured iron; a check in car-building, and a general disposition to hold off buying. Those which favor the furnaces are light stocks everywhere; a largely increased consumption except in the single item of railroad building; heavy orders looked for forward delivery; splendid crop prospects, an enormous immigration, and a greatly improved feeling in the iron trade in Great Britain. This latter feature is one of especial encouragement. Altogether, it may be said that indications have seldom been more favorable for a good trade throughout the year. Prices during the week have ranged within the following quotations for 4 months: Hot Blast Foundry, Hanging Rock, C C., No 1, $28 50@$29.50; No. 2, $27.50@$29.00; Southern, No. 1, $27.50@28.50; Strong Coke, No. 1, $26.50@27.50; No. 2, $2 .00@26 50; No. 3, $24.00@26.00; Soft Stone coal No. 1, $24 50@26.50; No. 2, $23.50@$24.50. Forge--Strong, Neutral, No. 1 Mill, strong, $24.00@$25.00; Cold Short, No 1 Mill $23.00@24.50. Car Wheel and Malleable Hanging Rock Cold Blast, $35@38; Hanging Rock Warm Blast, $29@30; Southern Car Wheel Iron $35@38; Lake Superior, $34@36; Lake Superior Malleable, $34@36.

CINCINNATI--(Reported by E. L. Harper & Co.) The market has ruled quiet throughout the week. The "hand-to-mouth" orders continue to characterize the purchasers, though prices are generally sustained, especially for the leading reputable brands.

COPPER.

We quote Lake Ingot at 18¾, with a quiet market. There are rumors that the lake companies are again arranging for shipments to Europe, in order to bolster up prices here, through selling to exporters at figures below those offered to home consumers. It is certain that Lake Superior copper is offered above at figures equal to 16 cents in United States. The shipment last year of 7,000 000 pounds of copper enhanced prices here. In reference to cost of working; present prices are in excess of what may be termed the legitimate figure Arizona copper, which is quite equal, if not superior to Lake, is now quoted, (refined) at 18¾c; Baltimore Copper is listed at 18½c. Manufactured Copper is unchanged. We quote pipe, 7½c; sheet, 8c; tin lined pipe, 15c, and Block, 45c; all less 10 per ct. to the trade

COAL.

Deliveries from the mining regions have been large, numerous additional charters of vessels have been made, and Lake shipments are going on actively. The only change in prices is in the retail branch of the trade, Massillon lump, Carbon Hill and Monday Creek lump and nut being 25 cents. lower. We quote for general charters Lake Michigan 75c; Detroit River ports. 70c; Lake Superior, Marquette, Houghton, &c., 60@70c; Duluth $1.

HARDWARE.

The retail trade continues brisk. The demand for nails is active. All the mills connected with the Western Nail Association were fully represented at its annual meeting on the 12th inst. Stocks were reported light, although production for the past three months had been greater than ever before, and prospects were considered encouraging The card rate of $3 40 was re-affirmed. Large purchases have been made of mechanics' tools and agricultural implements. The lock manufacturers have confirmed existing prices and terms of sale. The tack manufacturers have issued a new discount sheet; in addition to the discounts named, the usual extra discount of 10 per cent. and 2 per cent. for prompt cash is allowed. The manufacturers of bench and molding planes have advanced their prices, and now quote first-quality bench planes discount 20 per cent.; second quality ditto, 25 per cent.; Molding Planes, discount 15 per cent. Sydney Shepard & Co., Buffalo, N. Y., announce that they are supplying ice-tongs made of tinned malleable iron, which are placed on the market at 16 per dozen, subject to discount 25 and 10 per cent.

LUMBER.

Prices in lumber tend upwards, and full confidence in values is entertained by our dealers. The supply of dry lumber is not equal to the demand, and purchasers are inclined to overbid full list prices. No belief is entertained that the supply of lumber will fall short; but a conservative feeling prevails in favor of maintaining prices. The chief demand from the country is for immediate requirements. Although building has been somewhat interfered with by high prices, inquiries are active for the better grades of finishing lumber; also for foot-board, fencing, and long-piece stuff, as well as for some of the shorter kinds. Each dealer is now anxious to complete assortments in advance. No difficulty is likely to be experienced in adjusting values all along the line.

LUMBER.

PLANK, MIXED WIDTHS.
2 inch, 12, 14 and 16 feet, together.

A 1 and 2	$50
A 3	40
B	32
C	22
D	16
E	13

1¼ and 1½ inch.

A 1 and 2	$48
A 3	40
B select	32
C	22
D	16
E	13

BOARDS.
One Inch, mixed widths.

A 1 and 2 uppers	$44
A 3	36
B select	30
C	22
D	16
E	12

STOCK BOARDS.
12 Inches wide.

A 1 and 2	$45
A 3	38
B	32
C	24
D	16

STRIPS.
6 Inches wide.

A 1 and 2	$42
B	35
C	25
D	18
E	14
Norway Fencing Strips	18
Norway Flooring Strips	25

WORKED LUMBER
FLOORING.

Flooring—A 3	$42
B	38
C	24
D	20
Norway Flooring—A 3	28
C	22
D	18
Matched Drop Siding, 6 inches—A 3	42
B	38
C	24
D	20

Beaded Ceiling $2 higher than Flooring.

One half inch Bevel Siding—A 1 and 2	24
A 3	20
B	18
A Flooring—A 1 and 2	40

BILL STUFF.

Small, joists, 12, 14 and 16 feet	$16
18 feet and under	$17
Timber, larger than 8x8 special.	
Long timber, 20 feet and over, adds about $1 per foot per M. to the price of short.	
Cedar Posts, large	30 00
" " medium	25 00
" " small	$15 to 20 00

SHINGLES, LATH AND MILL WORK

Shingles XXX	$4 50
Clear Butts	$ 50
Lath	$ 00

Surfacing, one side, adds $1.50; two sides $2.
Matching flooring and drop siding, $2 50.

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Heavy Punch or Shears
Used for punching Railroad Fish Plates. Punches four holes at a time. Weight over Five tons. Good as new. Address
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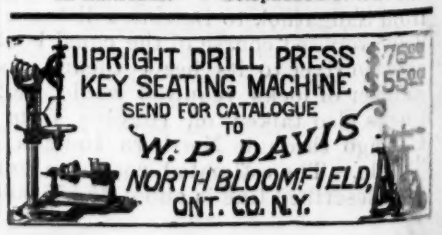

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Group of developed and producing gold and silver mines in District of Chapituato.
Group of developed and producing silver mines in district of Ozumatlan.
Group of undeveloped, working gold mines in district of Sinda.
Group of gold prospects in the district of Tiquio.

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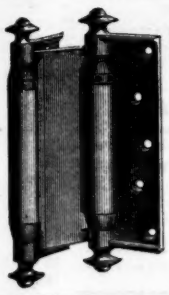

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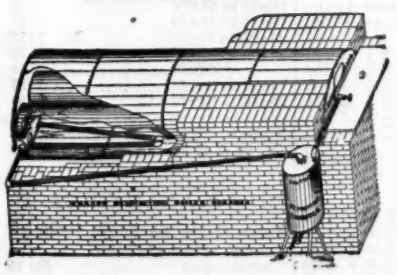

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Patented November 23, 1880.

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Portable Mulay Saw Mill,

With improvements recently made is unequaled as a neighborhood mill. It can be run by either steam or water power, and is especially adapted to the engines used for threshing.

It may be operated by either two or three men, and will cut as much lumber in proportion to the power and number of hands employed as mills of larger capacity.

It makes smooth and even lumber, leaves no stubshot, and will cut any sized log up to four feet in diameter. It may be transported from one locality to another and re-erected ready for sawing in from two to three days, and can be made profitable in localities where there is not sufficient timber to justify the erection of a large mill. Send for descriptive circular, price, etc., to

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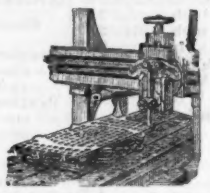
P.S.—We are also building a very superior Pony Circular Saw Mill suited to light power and medium sized logs.

Flanders Radius Planer.



For planing Links Blocks and Circular work on ordinary planer.
Price and descriptive circular on application.

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Manufacturers of the
Holland Lubricator,
for lubricating the Valves & Cylinders of Steam Engines.

Operating with downward visible drop. The principle of this Lubricant is entirely new; being the only one manufactured operating with a downward visible drop, and does not conflict with any other patented Lubricator, being protected with Letters Patent, granted July 5, 1881.

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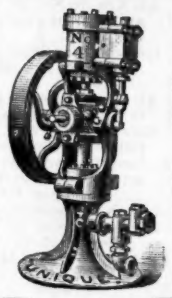

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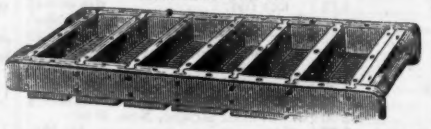

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2977 MACHINES 2977
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Machine and Blacksmith Tools of every description. Woodworking Machinery in all its Branches, Portable Engines, Upright and Horizontal Stationary Engines, 1 to 300 horse power, Locomotive Fire-box, Horizontal and Upright Boilers, 1 to 100 horse power, Waterwheels, Cotton and Woolen Machinery, Steam Pumps, Grist Mill Machinery, &c., &c., &c.
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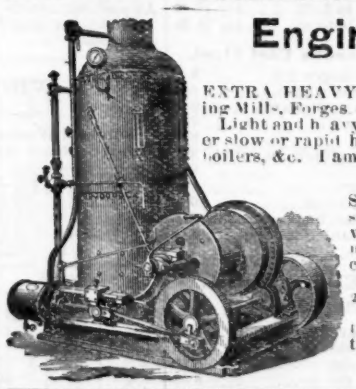

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And General Machinery.

EXTRA HEAVY STEAM ENGINES and other machinery adapted for Rolling Mills, Forges, Mines, &c., specially designed to suit local requirements.

Light and heavy Hoisting machinery of every description, adapted for either slow or rapid hoisting, and with or without Friction Clutches or Steam Boilers, &c. I am now prepared to manufacture my recently designed

FRICTION BAND HOIST,

Specially designed for rapid hoisting, which for cheapness, simplicity, driving capacity, ease and reliability of operation will be found superior to any other hoisting machine in the market. Patterns changed or new patterns made in any case to suit local requirements.

To parties wishing to build newly designed machinery I give especial attention.

Designs and estimates for machinery, as a base for negotiations, forwarded on application. Promptitude guaranteed. Correspondence solicited.

W. H. THOMPSON,
Cleveland, Ohio.

THE COMMON SENSE ENGINE.

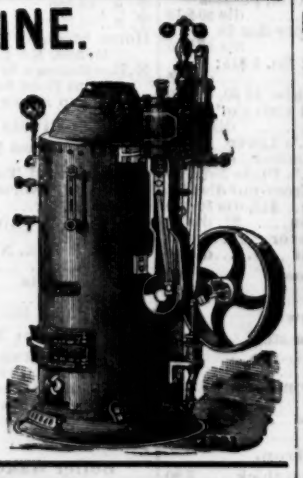
THIS IS OFFERED AS THE

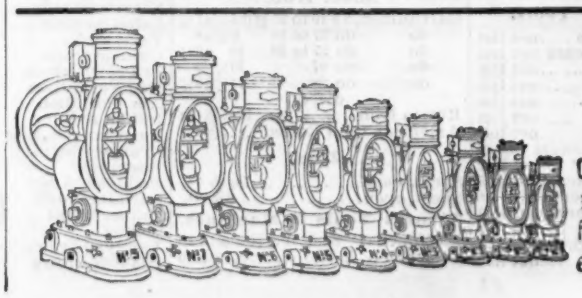
Cheapest and Best Engine
In the Market.

Is especially adapted to the requirements of Cotton Gins, Corn Mills, Machine Shops, Printing Offices, Clothing Houses, Warehouses, Foundries, Hotels, Bakeries, Wood Yards, Spice Mills, Elevators, Plantations, Cider Mills, Sausage Makers, Tanneries, Cabinet Shops, and for all purposes requiring from 3 to 10 horse power.

This Style of Engines and Boilers of all Sizes
kept in Stock. For sale by the

National Machinery Company,
Cor. Bond and Superior Streets, CLEVELAND, OHIO.





The Steam Pumps

Made by Valley Machine Co., Easthampton, Mass., are the Best in the World for Boiler Feeding and other purpose.

G. M. HEARD & CO.

Gold, Silver & Nickel Platers

109 Ontario Street.
CLEVELAND, O.

B. F. Roberts,

BOILER MAKER,

And Sheet Iron Worker.

BRIDGE STREET, SPRINGFIELD, OHIO
Special attention paid to taking out and Piecing Portable Flues
☞ Orders by mail to B. F. Roberts, Springfield, Ohio, promptly attended to.

E. F. ENSIGN,
JOBBER OF
Agricultural Implements,
WAGONS, FERTILIZERS, SEEDS, &C.
The Empire Grain and Fertilizer Drill and Twine Binding Harvesters Specialties.

Springfield Brass Foundry.
Pattern and Model Work a Specialty.

Castings done in White Metal, Brass, Zinc, Type Metal, Pig Lead, Pig Tin, Bar Lead, Bar Tin, Antimony, Copper, Spelter, &c., &c.

Cash paid for Old Brass and Copper

McLAUGHLIN & SHILLING.
68 South Limestone Street,
SPRINGFIELD, O.

PURE PREMIUM BONE.

The tried and never failing Fertilizer in all grains and grass crops. It has proved its value as such by years of actual use all over the world. Circulars and Price List free. Address all letters pertaining to the purchase of Premium Bone, or the sale of bones, to **Excelsior Fertilizer Works,** Salem, Columbiana County Ohio.

Cleveland Wholesale Prices.

HARDWARE.

Adzes.

Carpenter's ..... per doz	$16 80
Ship ..... " "	18 75
Heavy railroad .... " "	19 50

Axes.

Hunt's ..... ℔ doz	$ 9 50
Lippincott's Crown ℔ doz	9 00
Cut More ℔ doz	9 00
Peck's Double Bit ℔ doz	22 00
" Champion Blade ℔ doz	11 00

Anvils.

Eagle, Amer... per lb. 10c dis 15	
Wright's	11¼c@12c
Armitage's Mouse Hole	9¼c@9¾c
Trenton	10¼c
Wilkinson's	10c

Animal Pokes.

Beres, per doz	4 00
Eagle, per doz	5 00

Apple Parers.

Domestic & Reading ℔ doz	$7 50
Turn Table	9 00

Cleveland Stamped Elbows

Genuine Russia Iron

4 inch	per doz		4 50
4½ do	do		5 50
5 do	do		7 00
5½ do	do		8 50
6 do	do		9 50
7 do	do		11 00

Planished American Russia Iron

4 inch,	per doz		4 00
4½ do	do		5 00
5 do	do		6 50
5½ do	do		7 50
6 do	do		8 50
7 do	do		9 50

Charcoal Iron

4 inch,	per doz		2 00
¾ do	do		2 50
5 do	do		3 50
5½ do	do		4 00
6 do	do		4 50
7 do	do		5 50

25 per cent

Augurs and Bits. Dis

C S cut augurs	40@10
do do do bits	40@10
D C gimlet do	$6.00 Gross
Snells	@40
Russell Jennings'	10 10@10
Cook's pat augur	40@10@50
Post hole, net ℔ doz	$21@24

Balances. Dis

Catillon's, Frary's, Morton's 15 per ct

Bellows. Dis

Blacksmith's com new list, 40 ℔ ct
Hollower's new list, dis 40 ℔ cent
Hand, new list, 40 per cent

Bolts. Dis

Carriage and tire, com	80
do do Norway	65
Stove	40
Plow	30
Wagon	40
Machine & Square head	55
Skein,	55
Bolt ends,	55
Lag,	55
Tap,	55

Butts. Dis

Wrought brass	65
Cast, loose joint	40&10
Pin, japanned and silver tipped	45&10
Wrought, fast joint narrow	40&10
Wrought fast joint broad	45&10
rough loose joint broad	45&10
Wrought table and back flaps	40&10
Loose pin, reversible	45&10
Brass kettles—per lb	32@35

Chains.

Coil by cask.

3-16	¼	5-16	⅜	7-16	½
10¼	9	8	7	6½	6¼

Crucibles.

Per number	4@ 4½

Clothes Wringers

Keystone per doz	42@45

Chisels.

Hot and cold cutting ℔ lb	$ 30
Railroad track	30
Machinists	30
Chipping, mallet head	50
Cape	50
Packing	50
Stone cutters	50

Crowbars.

Steel point ℔ lb	$ 5
Solid steel	8

Drawing Knives.

Discount.

Witherby's	60@10 ℔ cent
Barton's	15
Adjustable handle	10

Emery.

Genuine Chester	7@ 8
Wellington	10@12

Files.

Auburn...$5 to £. dis 35 pr cent	
E. M. Boynton's, new list dis 25	
J. & Riley Carr	4.50 to £.
Johnson & Bro.	dis 30
Butcher's	4.50 to £.
Walter Spencer & Co.'s " Diamond"	4.50 to £.
Fisher's	4.75 to £
Moss & Gamble	4.50 to £.
H. Disston & Sons (new list)	dis 40 per cent
Heller Bros.' Horse Rasps	dis 25
Nicholson	dis 40
New American	dis 40
Union File Co	dis 40

Horse Rasps.

Heller's	dis per cent 30
" Arcade"	50 & 20

Harrow Teeth.

Iron ⅝ to 1 inch	per lb 3½c
Steel, square	4½c

Hammers.

Mason's stone hammers, steel faced and pene ℔ lb	15
Mason's stone hammers, solid cast steel	25
B. S. Napping hammers	30
Striking hammers, solid cast steel, 5 to 25 lb	20
Drilling hammers, solid cast steel, 3 to 6 lb	20
Turning hammers, full polished ..... each	2 00
Set hammers ℔ lb	35
Creasing hammers	35
Ordinary bush hammers	55

Nails.

BRADS AND PENCE.

10 to 60d	3 40
8 and 9d advance	25
6 and 7d ..... do	50
4 and 5d	75
3d	1 50
2d	2 75
3d fine	3 00
2d fine	3 75
¾ inch	3 00
4d barrel	1 00
1¼ inch barrel nails	1 50
1¼ do do do	1 75
1 do do do	2 50
¾ do do do	3 00
Cut spikes, all sizes	25
Clinch nails, all sizes	1 75

Casing and box nails 75 cts advance
Finishing nails, $1 25 do
Tobacco nails, 50 cts do

Nuts and Washers

	Dis
Nuts	7
Washers	6

Picks.

Railroad, 4 to 5 lbs ..doz	$7 75
5 to 6 lbs	7 75
to 7 lbs	8 50
7 to 8 lbs	9 50
Railroad Tamping Pick 7 to 8 lbs..doz	13 50
Mill Picks per lb	75c

Rivets.

Iron	dis 40
Tinned	dis 40
Copper	dis 33⅓

Squares. Dis

Steel or iron, case lots	50
Try squares and T bevels	40

Spikes—WROUGHT

All lengths by ¼ inch	4½c
do do do 5-16	3½
do do do ⅜, 7-16 & ½in	3¼

Shovels and Spades.

Ames' new list, July 1, 1881,	dis 15
Old Colony	dis 15
Remington's (Lowman's Patent)	dis 30
Rowland's	dis 40 and 10
Griffiths	dis 40&10

Shovels and Tongs.

Iron and Brass Head, R. & E. list	dis 60&2
Polished Steel, new list	dis 50&10&2

Sad Irons.

From 4 to 10 lbs	per lb 8¼ net
Self-Heating ℔ doz	$9 net
" Tailors ℔ doz	$18 net
Gleason's Shield and Toilet	dis 25
Mrs. Pott's Irons, double pointed	dis 40
Mrs. Pott's Irons, square back	45 dis
Enterprise Star Irons	45 dis
Comoined Fluter and Sad Iron ℔ doz	$15, dis 15

Saw Sets.

Boynton's patent X Cut, per doz $12; Hand Saw, per doz $10	dis 20
Stillman's Genuine, per doz $3 50 and $5 50	dis 20
Stillman's Imitation, per doz $3 25	dis 20&10
Common Lever, per doz $2	dis 30&10
Leach's No. 0 $8; No. 1 $15;	dis 15
Hammer, Hotchkiss $5 50,	dis 10
" Bemis & Call Co.'s new patent	dis 40&5
Bemis & Call Co.'s Lever and Spring Hammer	dis 30&5
Bemis & Call Co.'s Plate	dis 10
" " Cross-cut	dis 12½
Aiken's Genuine...$18,	dis 50&10
" Imitation.....$7,	dis 50
Hart's Patent Lever	dis 20
Disston's Circular	dis 40

Scales. Dis

Fairbanks'	25

Screws. Dis

Flat head iron or steel per cent dis	30
Flat head brass	30
Round head iron or steel	25
Round head brass	20
Coach or lag	55 ℔ ct

Tank Iron.

3-16, ¼ and ⅝ inch thick	3 20

Tacks. Dis

Black	30—10
Tin'd	55—10

Traps. Dis

New House	30
Peck, Stow & Co	50—10

Vises.

Solid box, Dis	40

Wrenches.

Coe's genuine	40 & 10
Coe's imitation wrought bar	50
Mechanics'	60 and 10

Bag Holders.

Sprengle's Pat, $18.00 per doz 40 per cent. dis.	

Planes.

Ohio Tool Co	dis 20
Schöta	dis 25
Bailey's Pat. Adjustable	dis 25

Rules.

Stanley	dis 66⅔ and 10

Sash Locks. Discount.

Payson Mnfg Co. "Perfect"	42
Simmons' Sash Supporters	20

Hinges.

Champion double acting spring hinges	dis. 30
Screw & Strap 8@12 in.	$6. net
Gravity Locking Blind Hinges, Sargeant & Co.	70&10

Wire.

Brass and Copper	dis 30
Bright & annealed, Nos. 0 @ 18	dis 50@52½
" " Nos. 19 @ 26	dis 60
" " Nos. 27 @ 36	dis 65
Coppered.....Nos. 0 @ 18,	dis 45
Galvanized, Nos. 0 @ 18, market list,	dis 40 @45
Tinned, Nos. 0 @ 18,	dis 40@45
Cast steel	dis 40
Tinned Broom Wire, Nos. 18 @ 25	dis 55
Annealed Fence, Nos. 8 and 9	dis 55@52½
Annealed Grape, Nos. 10 to 14	dis 52½
Galvanized Telegraph, Nos. 7 to 9 ℔ lb	7¼c
Galvanized Telegraph, Nos. 10 to 11 ℔ lb	8¼c
Galvanized Telegraph, No 12 ℔ lb	10¼c
Fence staples ℔ lb	5½@5¾c
Fence Staples, galvanized, ℔ lb	7@7½c
Stubs Steel Wire	$7 00 to £
Barb Wire, painted	8¼c
Barb Wire, galvanized	9¼c
Crucible Steel Ropes from ¾ in. at 9c to 1¼ in. at	32c
Best Selected Iron Ropes from 3-16 in. at 3c. to 1¼ in. at	33c

Gas and Steam Fitters' and Machinists' Supplies.

Gas and Steam Pipe—See Pipe Wrought.	
Enameled Pipe	dis 65
Artesian Well Casing	net list
Hydraulic Tubes	net list
Malleable Iron Fittings	net list
Cast Iron Fittings	dis 55
Globe Valves	dis 50
Angle Valves	dis 45
Check Valves	dis 45
Safety Valves	dis 45
Eddy Gate Valves	dis. 20
Steam Cocks	dis 45
Service Cocks	dis 45
Ball Gauge Cocks (net per dozen)	$15
Compression Gauge Cocks	dis 45
Miss. Gauge Cocks	dis 45
Register Gauge Cocks (net per dozen)	$15
Cylinder Cocks	dis 45
Air Cocks (net per dozen)	$2 75
Oil Cups	dis. 45
Steam Gauges	dis. 35
Water Gauges	dis. 45
Scotch Glass Tubes	dis. 60
Steam Whistles	dis. 45
Iron Body Globe Valves	dis. 55
Iron Body Safety Valves	dis. 55
Iron Rod Steam Cocks	dis. 55
Pipe Tools	special
Globe, Angle and Check Valves (Powell's regrinding)	dis 45
Guarantee "Jet Pumps"	dis 40
Mack's Injectors	dis. 25

Boiler Plates.

("Gaylord"--Standard Quality.)

C. No. 1	4 50
C. H. No. 1 Shell	4 60
C. H. No. 1, 50,000	5 00
C. H. No. 1, 55,000	5 50
C. H. No. 1 Flange	6 00
Firebox	
T. S., 60,000 (as per)	6 00
T. S., 65,000 (act of)	
Homo. Steel, 70,000 (of Cong)	8 00

Heads, ½c ℔ lb extra.

N.B.—Eastern brands of boiler plate at from 2-10 to 3-10c ℔ lb less than above prices.

Boiler Rivets—"Albany."

⅛, ¼, 11-16, and ½ in. diam. 5 50

Sheet and Tank Rivets.

"Norway."

All sizes	dis. 15

Nuts, Bolts, etc.

Square & Hex. Nuts	7 off list
Washers	6 off list
Machine Bolts	dis 55
Bolt Ends	dis 55
Boiler Patch Bolts	net list

Boiler Tubes.

"National" Standard Gauge 1 inch to 10 inch	dis 37½
"National" Standard Gauge 11 inch to 15 inch	dis 25
"National" Special Locomotive Tubes	net list

Boiler Makers' Tools.

Doty's Power Shears	net list
" Hand Lever Shears	net list
" Power Punch	net list
" Hand Punch	net list
Steel Screw Punch	net list
Iron Screw Punch	net list
Boiler Plate Rolls	net list
Buffalo Forges & Blowers	dis 20
Watson's " "	net list
Spring Tube Expander	dis 15
Roller Tube Expander	net list
National Tube Cleaner	dis 20
Wire Flue Brushes	net list
Anvils—"Peter Wright"	12½ ℔ lb
Solid Box Vises	net list

IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅛ to 1 inch	2 70
4½ to 6 by ⅛ to 1 inch	2 80
1¾ to 6 by 1⅛ to 1½ inch	3 15
1¼ & 1½ by ⅛ to ¾	2 80
1 & 1⅛ by ⅛ to ¾	2 90
⅝ & ¾ by ⅛ to ⅝	3 15

Round.

1 to 1⅞ inch	2 70
2 to 2⅝	2 90
2⅞ to 3¼	3 20
3⅜ to 4	3 70
4⅜ to 4½	4 20
4⅝ to 5	4 40

Square.

1 to 1⅞ inch	2 70
2 to 2⅝	2 90
2⅞ to 3¼	3 20
3⅜ to 4	3 70
⅝ to ¾	2 80

Heavy Band.

1¾ to 6 by ¼ and 5-16 inch	2 90
1 to 1¾ by ¼ and 5-16 do	2 95
⅝ to ¾ by ¼ and 5-16 do	3 00
⅝ to ⅞ by ¼ and 5-16 do	3 80

Half Oval and Half Round.

Wagon box iron ¼ and ⅝	3 95

1-10c per lb extra will be charged for cutting to specified lengths

Light Band.

1¼ to 2¼ by ⅛ to 3-16	3 25

Hoops.

1¼ to 2 , Nos 16 to 18	3 90
2¼ to 3¼ do 13 to 15	3 80

1-10 extra for each gauge lighter

Sheet Iron.

No 22 to 24	4 50
No 25 to 26....4 30 offd.	4 50 asked
No 27	4 90
No 28	4 85

English Steel.

Best cast ℔ lb	15½c
Extra cast	16½c
Round machinery, cast	18c
Swaged, cast	18c
Best double shear	15½c
Blister, 1st quality	13c
Refined tool steel	16½c
Spring calking	7¼@7½c
German steel, best	11c
2d quality	10c
3d quality	9c
Sheet cast steel, 1st quality	15½c
2d quality	14½c
3d quality	12½c

American Steel.

Best brands of refined cast steel	12c
Crucible machinery	8c
Open-hearth ditto	5c
Hammer cast steel	9½c
Spring cast steel	7½c
Bessemer and open-hearth spring	5½c
Ditto plow	5½c
Steel boiler plate	6½@7c
Bessemer mach nery	5 @6c
Spring and calking	7½@7½c
Tire	4 @4½c
Sleigh shoes	3½@3¾c

Bessemer Steel Tire.

⅝ to 1 by 3-32	4½ ℔ lb
⅝ to 1 by ⅛ to 5-32	4½ ℔ lb
⅝ to 1 by 3-16 to ¼	4½ ℔ lb

Miscellaneous Cast Steel.

Auger and auger bit	8
Axle steel for wagons	8
Frog points and plates	9
Frog size bars	7½
Pick, plain	8½
Pick, and Mattock, beveled	8½
Skate Steel	8½
Table cutlery	8½
Trap spring steel	9
Pike and cant hook	8½
Coal and granite wedge	8½

TINNER'S STOCK.

Tin Plate.

10x14 IC	charcoal		$6 25
do IX	do		8 25
12x12 IC	do		6 00
do IX	do		8 50
14x20 IC	do		6 50
do IX	do	$6 25@7 50	
DC, 12¼x17	do		6 00
DX 12¼x17	do		8 00

For each additional X add 2 00

IC 10x14	coke	$5 75@5 50	
IC 14x20			
IC 12x12	do	6 00@5 75	

Tin.

Banca	per lb.	28c
Straits	"	25c
English	"	25c
Spot Tin	"	25c

Solder.

½ and ½	14c
Extra	14c
No. 1	13½c

Pat Planished Sheet Iron.

{A}	per lb 10½c
{B}	9½c

Nos	10	15	21	25
to	14	20	24 & 26	
Com	3-60	3-80	4-00	4-20
Char	5-60	5-60	6-00	6-20

Sheets over 28 in. wide ¼c extra

Sheet Iron.

Galvanized, No 10 to 20 ℔ lb	8½ a7¼	
do	do 22 to 24	9 a8
do	do 25 to 26	10 a8½
do	do 27	10½ a9
do	do 28	11½ a9½
	dis, 40	
Russia Iron		12½@12c
American Cold Rolled		5@7½

Zinc.

Sheet, cask	7½@ 7¾
Sheet, open	8@ 8½

Tinners' Tools & Machines.

Machines (P. S. & W.)	list add 20
Tools (P. S. & W.)	add 6

COPPER.

Lake Ingot	18¼@18¾c
Baltimore	19c
Arizona	18¼c

Sheathing Braziers Copper, Bolts, &c.

Brazier's Copper, ordinary sizes, 16 oz. per sq. foot, and over per lb	30c
Brazier's Copper, ordinary sizes, under 16 oz. and over 12 oz. per sq. foot, per lb.	32c
Brazier's Copper, 10 oz. and 12 oz. per sq. ft. per lb.	34c
Brazier's Copper lighter than 10 oz. per sq. ft. per lb	36c
Circles less than 84 inches in diameter. per lb.	33c
Circles 84 inches in diameter and over per lb.	30c
Segment and Pattern sheets per lb.	33c
Locomotive Fire Box sheets per lb.	30c
Sheathing Copper, over 12 oz. per sq. ft. per lb.	28c
Bolt Copper per lb.	30c
Copper Bottoms. per lb.	31@32c

No copper in Sheathing except 14x10 inches, and not to exceed 34 oz. to the sq. ft.

Tinning.

14x18 per sheet	6c

All other size sheets, 2½c per square foot. For tinning both sides, double the above amount.

BRASS.

Cash prices for Roll and Sheet Brass. For less quantity than 100 lbs. add 3c per lb.

High Brass

All Nos. not thinner than No. 28, wider than 2 in. not wider than 14 inch	30c
All Nos. to No. 28, inclusive, and widths over 14 to 20 in. inclusive	35c
All Nos. to No. 28, inclusive, and widths over 20 to 30 in. inclusive	38c

½c per lb. advance on each No. above Nos. 28 to 38, inclusive.

All Brass thinner than No. 8 is Platers' Brass at	53c
Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 inches, in width wider than 2 inches	37c

Low Brass,

4c per lb. more than High Brass.

Gilding metal 8c per lb. more than High Brass	
Platers' or Gold Metal In Bars	48c
Sawed	51c
Planed or Polished	54c

For Slitting

Metal in width in. to ¼ in. to No 28, inclusive, 1c per lb advance	
Metal, in width 2 in. to 1 in, thinner than No. 28, 2c per lb. advance.	
Metal, in width ⅛ in. to ¼ in. thinner than No. 28, 5c per lb advance.	
Metal ¼ in in width and less, 10c per lb. advance.	

Any of the above widths cut to particular lengths, add 7c per pound.

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas Pipe.

Inside Diameter Inches.	Plain, Price Per Foot.	Galvan. or Enameled Per Foot.	Outside Diameter Inches.	Weight Per Foot.
⅛	08		.40	.24
¼	08	$0 11	.54	.42
⅜	09	12	.67	.56
½	11	15	.84	.85
¾	13½	19	1.05	1.13
1	19	28	1.31	1 67
1¼	27	40	1.66	2.26
1½	33	47	1.90	2 69
2	46	64	2.37	3.66
2½	75	1 00	2.87	5.77
3	95	1 30	3 50	7 55
3½	1 25	1 70	4 00	9 05
4	1 50	2 05	4.50	10 73
4½	1 75	2 40	5. 0	12.49
5	2 25	3 00	5.56	14.56
6	2 75	4 00	6.62	18.76
7	3 75	....	7.62	23.00
8	4 75	....	8.62	28.00
9	6 50	....	9 68	34.40
10	8 00	....	10.75	40.64
12	12 00	....		54.65

Discount, plain, 55 per cent; galvanized, 52½ per cent.

PAINTS.

White Lead, Eng. oil	9	@9½
do American	do	7@7½
do do	dry	@7½
White Zinc F. oil	10	@11¼
do do	dry	8 @10
do American.	oil	@9
do do	dry	5½@6½
Chinese blue ℔	lb 75	@80
Prussian	do oil	do 45 @55
Ultramarine	blue	do 18 @30
Celestial	blue	do 8 @10
Paris	green	do 25 @30
Chrome	green	do 8 @14
Fr Crown	green	do 16 @18
Eng Vermillion		do 55 @60
Am Vermilion		do 15 @22
Indian	red	dry 9 @12
Venecian	red, Eng	do 1¾@ 2
Orange	mineral	do 10 @14
Rose	pink	do 10 @13
Red	lead, Am	do @ 7½
Carmine	No 40 ℔	oz 60 @75
Umber	burnt ℔	lb 4 @ 8
Sienna		do 4 @15
Vandyke	brown	do 10 @12
Spanish	brown	do @ 1¾

SCRAP IRON AND OLD METAL

DEALER'S SELLING PRICES. Net Tons.

No. 1 wrought scrap	$28@30
Sheet and hoop "	19@18
Cast scrap, (No. 1 heavy)	19@21
Cast Scrap (Stove Plate)	14@18

OLD METALS.

Old copper per lb	16c
No. 1 H. Brass per lb	16
Heavy yellow Brass do	12
Light Brass per lb	10
Scrap Zinc per lb	@4
Tea Lead per lb	@4¼
Heavy Lead per lb	4¼@5

LEAD.

American, ℔ lb	5¼@6c
Bar, ℔ lb	7c net
Pipe, ℔ lb	7¼c dis 10 per ct
Sheet, ℔ lb	8c dis 10 per ct
Tin-lined pipe ℔ lb	15c dis 10 per ct
Shot Drop 7c; Buck	8c
Chilled Shot	8c

Babbitt Metal.

N. P. U. ℔ lb	@9c

A. 28c., B. 25c., C. 15c.

COAL,

WHOLESALE.

Wholesale f.o.b vessel at Cleveland:	
Carbon Hill and Monday Creek	$2 65
Massillon	2 85
Brier Hill	3 50@3 75
Pittsburgh	3 00
Salineville	2 50
Tuscarawas	2 25

RETAIL.—Delivered.

Massillon Lump	$4 00
" Nut	3 75
Carbon Hill and Monday Creek, lump	3 75
Carbon Hill and Monday Creek, nut	3 50

75c less on cars by car load.

Anthracite Stove and Chestnut	7 15
Egg and grate	6 00

Hides and Leather.

Prime cured hides,	7¼@7½
Green hides	6@6¼

Bull, scrubby, badly scored or damaged, cured, two-thirds price.

Prime dry hides	13@14
Horse hides, green	$1 75@2 00
Horse hides, dry	$2 00@2 25
Prime cured veal calf	12½
Prime Deacon Skins, salted	60c
Pelts, wool on	32@34
Fresh slaughter sheep	30@$1 50
Fresh slaughter lambs	50@60
Green calf skins	12
Hemlock rough	23@24
Oak rough	25@26
Oak sole	37@40
Union harness	32@35

GLASS.

(Per box of 50 feet)

SINGLE THICKNESS

6x8 to 10x15	7 50
11x14 to 15x24	8 50
16x24 to 20x28	9 75
15x34 to 24x30	10 75
26x28 to 24x36	11 50
28x38 to 26x44	13
26x46 to 30x50	14 00

DOUBLE THICKNESS

6x8 to 10x15	11 7
11x14 to 15x24	18 25
16x24 to 20x28	15 75
15x34 to 24x30	17 25
26x28 to 24x36	18 50
26x38 to 26x44	21 25
30x50	22 50
30x52 to 30x54	23 25
30x56 to 34x56	25 00
34x58 to 34x60	27 75
36x60 to 40x60	30 00

Dis 60 & 15 single, 60 & 20 double

OILS & AXLE GREASE

Pure Oils. packages included

Sperm, winter bleached per gal		@1 15
Elephant, winter bleached, per gal		@ 70
Whale, winter bleached per gal	60@	65
Seal, winter bleached	80@	85
Bank oil	48 @	51
Straits	50 @	53
"A" oil for tanner's use	35 @	40
Lard oil extra W S	90 @	95
do No 1 do	76 @	79
do No 2 do	63 @	66
Tallow oil	65 @	72
Neatsfoot oil pure	1	05
do No 1		90
Linseed oil, raw	@	60
Linseed oil boiled		63
Cotton seed oil white	64 @	66
do do yellow	60 @	63
Carbon oil Ohio legal test	9½@	11½
West Virginia lubricating 28 deg	@	29
Pure Mecca	55@	50
Paraffine oil winter pressed grav 25		
do do do	25@	30
Machinery		40
Engine		50
Miners' oil	40@	45
Drilling oil		40

Compound Oils, (light color'd)

No 1 Sperm signal oil	65@	68
No 2 do do	58@	63
No 1 wool and spindle oil	40@	50
Golden machinery oil	30@	35
No 2 Mecca (dark colored)	20@	30

Axle Grease (light colored per gross ... 7 50@ 8 00

Tallow, prime	8¾@	8¼
Tallow, dark and No. 2	6¼	
Beeswax	20@	

Cleveland Business Directory.

Assayers and Analytical Chemists.

JUDSON, W. E, Analytical Chemist, 8 Cushing Block.

Bolt and Nut Works.

HOTCHKISS & GAYLORD, manuf'rs. Machine, Plow & Elevator Bolts, Coach Screws.

Boiler Makers.

SMITH & TEACHOUT—(Established 1857.) Boiler, Tanks, Stills etc. 439 Broadway.

Bridge Builders.

BUCKEYE BRIDGE AND BOILER WORKS mfrs of Arch & Truss Bridges, Boiler Tanks and Oil Stills. Bet. Wasson St. and Case Ave.

Coal and Iron Exchange.

JACKSON IRON CO. Iron Ore and Pig Iron. Rooms 8 and 9. Fayette Brown, Gen. Agent.

RHODES & CO. Coal, Iron Ore an Pig Iron. Rooms 1 and 2.

Carriage Blacksmith.

STRIEBEL, CHAS. maniac'r. of Carriages and Wagons and platform trucks. Horse shoeing and general blacksmithing .36 Woodland ave.

Carriage Bolts.

THE COLWELL & COLLINS NORWAY BOLT CO., manufacturers of Philadelphia Carriage and Fire Bolts.

Church and School Furniture.

FAULHABER, GEO. manufacturer of School and Church Furniture. Fine Hard Wood work a specialty. 205 Ontario Street.

Custom Boots and shoes.

ROONEY, JOHN manufacturer of hand-made Boots & Shoes, custom made and warranted 11 Ontario Street.

Carriage Repository.

GREENE'S, J. O., Carriage Repository, 408 Superior street and 52, 54 & 56 Rockwell street, dealer in Fine Carriages. Repair shop in connection.

SLATER, G. A., Carriage dealer, sells the best work for the lowest price. A fine assortment always on hand. Repository 505 Euclid Avenue

Coal and Pig Iron.

ANDREWS, HITCHCOCK & CO., Briar Hill Coal and Pig Iron. 122 Water Street.

Distillers.

BLOCH, S. H. & E., Distillers, and Wholesale dealers in Kentucky Whiskies. 66 Water St.

Electrical,

ELECTRIC SUPPLY CO. manfrs and dealers in Electric Burglar Alarms, Annunciators, Call Bells and Batteries. Telephone lines built and repaired. 149 Seneca Street.

Fresco Artists.

KEMMER & KUSHMAN DECORATIVE CO., Fresco Artists, Fine Modern Wall Papers. 501 Euclid ave.

Foundries.

BOWLER & CO., Car Wheels, Patent Chilled Frogs, and all kinds of Castings. 9 Water.

CLEVELAND MALLEABLE IRON CO., manufacturers Malleable Iron Castins.

LAKE SHORE FOUNDRY, Water and Gas Pipe, Light and Heavy Castings. Alabama st.

TAYLOR & BOGGIS, successors to H. & H. F. Taylor, Iron Founders, 66 to 76 Central Way.

VIADUCT FOUNDRY COM'Y, Acmis, Carlin & Strangward manfrs of Machinery Castings Fine Light Castings a Specialty. Office & Works 14 to 76 and 77 Detroit Street, near Center.

ECLIPSE IRON WORKS manufacture Casting of all kinds. Cor. Center & Winslow Sts

LITZSIMONS WM. & SON, Rolling Mill and Machinery castings. Rolls a Specialty. No. 100 Broadway.

File and Saw Works.

PARKIN, W. H. & CO., Hand-cut Files and Rasps, dealers in Disston's saws, 11 So. Water

Grindstones.

OHIO GRINDSTONE CO. manufacturers of and dealers in Grindstones. 127 Superior st.

Hotels.

FOREST CITY HOUSE, cor. Public Square and Superior st., Terrill & Ingersoll, Props.

KENNARD HOUSE, D. McClasky, Prop.

NEW ENGLAND HOTEL, Water st., W. W. Wolcott, Prop. Refitted and refurnished.

STRIEBINGER HOUSE, between Ontario and Seneca sts. $2.00 per day. Hawley & Langton

CITY HOTEL, Seneca street. H. B. West, proprietor. $1.50 per day.

Hides, Pelts and Leather.

DENNISON BROS., dealers in Hides, Pelts, Furs and Tallow, 48 and 50 River street.

Hardwood Lumber.

MARTIN, J. T. dealer in Hardwood Lumber, Stone's Levee, near Central Way.

Lumber.

WOODS, PERRY & CO., manufacturers and dealers in Lumber, Lath, etc., 5 Carter st.

FISHER, WILSON & CO., wholesale lumber dealers (pine & hard wood), rough and dressed lumber, timber, lath, shingles, etc. 47 Central Way

KRAUSE, C. A., & SON, wholesale and retail dealers in lumber. Yards cor. Superior and Wason and 281 Merwin streets.

Cleveland Business Directory.

Flue Cleaner.

CLEVELAND FLUE CLEANER M'F'G. CO. manufacturer of Atchison & Doolittle's Patent Steam Flue Cleaner, 56 South Water Street.

Hardware and Iron.

BINGHAM, WM. & CO., Hardware, Iron, Nails and Metals, 146 and 150 Water street.

CLEVELAND ROLLING MILL CO., manuf'rs. of Steel and Iron Wire and Steel Tire.

WORTHINGTON, GEO. & CO., Hardware and Dealers in Metals, Water street.

Lime Manufacturers.

RUSSELL LIME CO., manufacturers of White Lime; also dealers in Plaster, Cement, etc. 56 Lime street.

Machinery and Boilers.

CLEVELAND STEAM FURNACE CO., Engines and Boilers, cor. Detroit and Center sts.

KRITCH, K. E. Metal Pattern Maker. Small machinery repaired. Lawn Mower sharpening a specialty. 42 South Water Street.

UNION MACHINE WORKS, Wason Street bet. St. Clair and Superior Sts., manfrs and agents of G. W. Clayton's Elevators for passengers and freight. General machinists & jobbers.

PANKHURST, T. J. & CO., Valley Machine Works, manufacturers of Machinists' Tools, &c. Fine lathes a specialty. 6 Champlain street.

Machinery Depot.

CLEVELAND MACHINERY DEPOT, (now National Machinery Depot.) The largest stock of New and Second-hand Engines, Boilers and Machinists' Tools. Shop and Warehouse corner Bond and Superior streets.

Mercantile Agency.

THE MERCANTILE AGENCY. R. G. Dun & Co. proprietors. 121 Superior street.

Oil Manufacturers.

AMERICAN LUBRICATING OIL CO., manufacturers of lubricating oils, 25 Euclid ave.

Paints and Oils.

MASTERS, J. N. jobber in Paints, Oils, Varnisher. Brushes, 54 Prospect st.

Pattern and Model Makers.

WHITTINGHAM, J. & C., Metal Pattern and Model makers 62 Canal Street.

STAIR BUILDER.

PFEIL, CHAS, Stair Builder; Hard Wood Mantles and Office Railing. Works, 49 Canal street, Cleveland, Ohio.

JOHNSON & TURNER, Stair Builders, and manuf'rs of Mantels, Odd Pieces of Furniture, &c. 56 West street, up stairs.

Steel Stamps and Stencils.

FLEHARTY, J. H. & CO., Rubber Stamps, Seals, Stencils. 191 Superior street.

Tanners.

GAENSSLEN BROS., Tanners, and dealers in leather, oil and shoe findings. 59 Water-st.

Trunks and Valices.

FABER, J. manuf. Trunk, Traveling Bags and Ladies' Fine Satchels. Sample Trunks and Cases a Specialty. 55 Public Square.

Vessel Agents.

WEBB, H. J. & CO., Ship Brokers and Vessel agents. 17 & 18 Board of Trade Building. 122 Water Street.

Wood Carving.

HERKOMMER, J., Carver and Ornamenter in Composition. 225 Erie street.

Business Directory.

Akron, O.

AKRON IRON CO., manufacture best Common, Refined and Charcoal Iron.

CASCADE HOUSE, cor. Mill and Summit sts., near Depot. J. Downie, Prop.

MCNEIL, J. C., Steam Boilers, Heavy Sheet Iron Work. Repairing promptly executed.

PERKINS, C. E., dealer in Agricultural Implements, machinery, and Manufacturers' Ag'nt

TAPLIN, RICE & CO., manuf'rs. of Stoves and Hollow Ware, dealers in Tinners' Stock, etc.

WEBSTER, CAMP & LANE MACHINE CO., Founders and Machinists, 12 Main street.

Alliance, O.

ARLINGTON HOUSE, cor. Main and Liberty Streets. Centrally located. Sample Room for Commercial Travellers. H. S. Adams, proprietor

ALLIANCE INDUSTRIAL WORKS, E. Fawcett & Son, Proprietors, manufacturers of portable and stationary steam engines and circular saw mills.

MCFARLAND, J. W. Engine and Machine Builder, and General Machine Jobbing

Canton, O.

DIEBOLD SAFE & LOCK CO., manuf'rs. Safes, Locks, Bank and Safe Deposit Works.

NOVELTY IRON WORKS, Mill work, Shafting, engines, Imperial job printing press, etc

NEW AMERICAN HOUSE, Canton. Fred. Hipp, Prop.

EBERSOLE & KAILEY, Machine and Jobbing Shops. Gearing for Patterns or Machinery a specialty. Models of all kinds made & repaired.

Business Directory.

Cuyahoga Falls, O.

THOMAS BROTHERS, manfrs of Ohio Stone Ware. Cuyahoga Falls Stone Ware Factory, cor. Main and Broad streets,

TURNER, VAUGHN & TAYLOR, manufacture engines, presses and grinding machinery for clay; also paper, chain, wire and flour mill machinery. Send for Circulars and price list.

Columbus, O.

PAT. ADJUSTABLE WINDOW CURTAIN Cornice, manufactured by Strader's Curtain Cornice Works.

ROYCE & PULLING manufrs of Patent Steam Pumps for all purposes. Store room 30 High street. Works Nos. 5 and 7 Scioto street.

COLUMBUS MACHINE CO. manfrs. of Blowing, Stationary and Portable Engines, Brass and Iron Castings. West End Nat. Road Bridge.

REYNOLDS BROS., manufacturers of hand-cut Files and Rasps. Old files re-cut. Send for Price List.

CITY BOILER WORKS, manfrs of Stationary, Portable and Locomotive Steam Boilers. All work warranted Borger Bros. & Co.

MURRAY, HAYDEN & CO., manfrs of Malleable Iron. Cor. Randolph & West streets.

RAGAN W. H. & CO., manfrs of Doors, Sash and Blinds, Mouldings, Casings, Balusters, Newels, Hand-railing, and Builders' Mill Work of every description. Cor. West Broad & Center.

Canal Dover, O.

HEBERMAN, E., manufr. and dealer in harness leather, upper, kipp and calf. Also, manufacturer & dealer in prime English Dairy cheese. Highest market cash price paid for hides.

Garrettsville, O.

UDALL & NILES Foundry and Machine Shop. General repairing and jobbing on short notice

Geneva, O.

THE ENTERPRISE MACHINE CO., L. L. Crane, Pres't, manfrs of Machinists' Tools and Machinery. Gear Cutting a specialty.

Lima, O.

LIMA HOUSE, centrally located; telegraph office in the house. J. Goldsmith, Prop.

Massillon, O.

TREMONT HOUSE, Jas. M. Clark, proprietor. Terms $1.00 per day. Good sample room for Commercial Travellers.

CITY CARRIAGE WORKS, P. H. Young, prop. manfact'r of Carriages, Phætons and Spring Wagons. Work warranted. Cor. Tremont & Erie.

Painesville, O.

NORTH AMERICAN CUTLERY CO., m'f'r's of Steel Shears and Scissors—best quality.

Ravenna, O.

THOMPSON, T. F., dealer in Agricultural Implements, farm machinery, hardware, seeds, fertilizers, &c. Cor. Main and Prospect sts.

BALDWIN, D. L. & SON, Contractors & Builders and manfrs of all kinds of Moulding, flooring, siding, &c. Rip, Band and Scroll Sawing.

Steubenville, O.

FIELDING, RICHARD, proprietor Commercial Hotel, 222 Market street. Comfortable rooms and beds. Sample rooms for Commercial men.

Sandusky, O.

SANDUSKY WHEEL CO. manfrs. of Sarven Patent Wheels, Carriage Bodies and Seats, Plain Wood Hub Wheels, Banded Hub Wheels, Jacobs' Patent Neck Yokes.

WOOLWORTH, JAMES, manfr. of Axe, Pick, Sledge and Auger Handles, Hickory Whip Stocks, &c. Established in 1850.

FULTON MACHINE WORKS & FOUNDRY, Barney & Kirby, proprietors, manfrs. of Stationary and Portable Engines and Boilers, Rolling Mill Machinery, Circular Saw Mills, etc.

Toledo, O.

BAKER, HERBERT, Machine Shop and Iron Foundry. 98 and 100 Erie street.

TOLEDO FOUNDRY AND MACHINE CO. builders of Steam Engines, Circular Saw Mills and all kinds machinery. Water St., cor. Cherry

RUSSELL IRON WORKS, manfrs. of Architectural Iron Work, castings, pulleys, shafting and steam bending machinery. Cor. Water and Lagrange streets

STANDARD SAW WORKS, H. Bartley, manufacturer and dealer in Saws of every description All kinds of Springs made from Sheet Steel. Reaper, Hay Knives Truss Springs, &c. made to order. 92 St. Clair Street.

UNION Wooden Ware Manufacturing Co. manufacture Sewing machine, washboards, children's wagons, carts, wheelbarrows, sleds, kitchen wooden ware, &c.

HEPBURN BROTHERS, proprie. Union Boat Works. Boats of all kinds made to order. For sale or rent. Water Street foot of Cherry.

THE PUREST AND BEST BONE DUST. Send for Circular. S H. Morgan & Co.

Youngstown, O.

BELL, EDWIN & SON, manuf. of Nail Kegs, Pat. coiled hoops, slack barrel and keg heading and oil barrel stock.

DINGLEDY, G. H. dealer in rough and dressed Lumber, Shingles and Lath.

MORTON HOUSE, formerly Maitland House, James Morton, Prop.

TOD HOUSE, cor. Diamond and Market streets. Henkel & Bowman, Props.

Zanesville, O.

KIRK HOUSE, William Kirk, proprietor. $1.50 per day.

Business Directory.

Erie, Pa.

ERIE STEAM BENDING WORKS. H. G. Fink, prop'r, manufacturer of Bent Felloes, poles, shafts, bob runners, etc. Cor. 12th & Cherry.

GUNNISON, A. B., wholesale manufacturer of Wood Pumps. 233 East Twenty-Second St.

BALL ENGINE CO., limited, manufacturers of Automatic Engines of 15 to 30 horse power

NOBLE SEWING MACHINE CO. manfrs of the New Noble Sewing Machine. Send for circulars and prices.

A. B. FE' GEMAKER & CO. Church Organ builders. Descriptive catalogue furnished on application.

Meadville, Pa.

CURRY & CO. general jobbers in Castings of all kinds.

MYERS & GREEN, Founders, general jobbers in Castings of all kinds. Orders filled on short notice.

SCHAUWEKER, F., proprietor of French Creek Tannery, manufr of leather belting, harness fair line and skirting leather.

Oil City, Pa.

REID, JOS. Machinist, steam engine and pump repairing. Brass and iron castings, light and heavy, made on short notice.

Sandy Lake, Pa.

EBERMANN, W. S. & SONS, manfrs. of the celebrated Ebermann Boiler Feeder. Send for Circulars and Price List.

Titusville, Pa.

FOSTER & MCKAY, dealers in boilers and engines, tubing, casing, old iron, rope, and all kinds of metals. Washington street, nr. Railroad.

Rochester, Pa,

OLIVE STOVE WORKS, (limited) manufacturers of Stoves and Hollow Ware.

Pittsburgh, Pa.

PRINTING PRESSES. W. A. Bunting, manufacturers' agent. Printers supplies, type, cards. 42½ Sixth Street. [Up stairs.]

Wheeling, W. Va.

EXCELSIOR MACHINE WORK, Redman & Co., general machinists and manufacturers of Marine and Stationary Engines, Hangers, Pulleys, Shafting, &c. Cor. 18th & Chapline streets.

Olean, N. Y.

MYRICK BROS. & CO., manufact'rs Engines and Boilers, oil drilling tools, rig irons, etc.

Rochester, N. Y.

GOWE, JNO. N., mfrs. of Specialties, such as Machine forging, bridge bolts and trusses, railroad switches, spike, mall, chisels, &c.

ELEVATORS for Hotels, Factories and Private Houses. J. S. GRAHAM & CO.

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WOOD-WORKING MACHINERY. Send for Catalogue. J. S. GRAHAM & CO.

KINGSBURY, G. J., Cracker and Oven Machinery Works. Shawmut Building, Mill St.

WISEMAN, Albine, manufacturer of all kinds of Shoemakers' Tools. 117 North Water St.

ULSCHT & LINN mfrs of Wood Lathes, Engraving Machinery, &c 131 N. Water street

RAZOR STROPS. Sole mfrs. of all kinds of Razor Strops. Ulscht, Linn & Co. 131 N Water

Buffalo, N. Y.

SANDS, PAUL, Marine and Stationary Steam Engine Works mfr. of drilling machines, foot and power lathes. 70 Columbia street.

EMPIRE STATE MF'G CO., O. F. Swift, prop'r, manfr of Fluters, Sad Irons, Spun Copper & Half Copper Tea Kettles. Washington, cor. Ohio

WHITE, L. & I. J. manfrs of Coopers' Tools, Carpenters Tools, Draw Shaves, Cleavers Choppers, Ship Tools, &c. 312 Exchange street.

THE BUFFALO NUT AND BOLT CO [Limited.] Manufrs. of Hot Pressed Nuts, Bolts, Washers, Rivets, &c. No. 226 Ohio Street.

Louisville, Ky,

HAIGHT, ROBERT. Gold, Silver and Nickel Plating and Brass Finishing Shop. Car Trimmings and Steamboat work a specialty. 1 West Market street

Union City, Ind.

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Cor. Circle & Market Sts.
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55 FRANKFORT STREET 55
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Lake Shore & Michigan Southern.

EAST BOUND TRAINS.

	Arrive.	Depart.
No. 20 Limited Express	1:35 A M	*1 50 A M
No. 6 Atlantic Express	*7 05	*7 30
No. 10 Buffalo Accom.	11:00	11 15
No. 8 C. & St. L. Exp.	*2:25 P M	*2 55 P M
No. 4 Special N. Y. Exp	10:10	10 35
No. 2 San. Div. Accom.	10:12	
No. 12 Conneaut Accom.		4 50
Nottigham Accommodation (Sundays only)	10 05 A M / 4 45 P M	9 00 A M / 2 15 P M
No. 18 Elyria Accom.	8.50 A M	

WEST BOUND TRAINS.

	Arrive.	Depart
No. 13 Mich. Accom.		6 40 A M
No. 1 Special Chicago Ex.	*6 35 A M	7 00
No. 3 Toledo Express	1 25 P M	3 30 P M
No. 21 St. Louis Express	*1 40	*2 05
No. 5 Pacific Express	*7 05	*7 35
No. 11 Conneaut Accom.	8 40 A M	
No. 19 Pt. Clinton Accom.		5 00
No. 7 Michigan Exp.	*2 50 A M	*8 05 A M
No. 17 N. Y. & Chi. Ex.	11 43 P M	11 53 P M

Cleveland, Columbus, Cincinnati & Indianapolis.

ARRIVALS.

No. 2 Col. & Cin. & Ind'polis Ex.	*7 10 A M
No. 8 C. T. V. & W. & Clev Accom.	10 30
No. 12 St. Louis & New York Exp.	3 00 P M
No. 4 Special Cin & New York Exp.	3 20
No. 10 Wheeling & Cleveland Exp.	8 25
No. 6 Indianapolis & Columbus Exp.	10 20

DEPARTURES.

No. 1 Cincinnati & Columbus Exp.	8 00 A M
No. 11 Cleve. Indianap. & Wheel'g Ex.	7 15
No. 3 St. Louis & Cincinnati Ex.	*2 00 P M
No. 5 Night Express.	*7 25
No. 7 C T V & W. & Col. Accom	4 00

Cleveland, Tuscarawas Valley & Wheeling.

ARRIVALS.

No. 4 Wheeling & Cleve'd Exp.	8 25 P M
No. 2 Uhrichsville Accom	10 30 A M

DEPARTURES.

No. 1 Wheeling & Cleve'd Exp.	7 15 A M
No. 3 Uhrichsville Accom	4 00 P M

New York, Pennsylvania & Ohio.

ARRIVALS.

No. 7 Mahoning Valley Accommo.	10 55 A M
No. 3 New York Express,	*7 00 P M
No. 1 New York Express,	*8 50 A M
No. 3 Pittsburgh Express,	*7 00 P M
No. 5 Pittsburgh Express,	3 10
New York Express	3 10
No. 9 Youngstown and Pitts. Local	10 15

DEPARTURES.

No. 12 New York Express,	*7 10 A M
No. 4 Youngstown Local,	11 15
No. 8 Mahoning Accommodation,	4 25 P M
No. 2 New York Express,	10 45
No. 12 Pittsburgh Express,	*7 10 A M
No. 6 Pittsburgh & Main Line Express	2 30 P M

Cleveland & Pittsburgh.

DEPARTURES.		ARRIVE
Mail	8 50 A M	1 15 P M
Express	1 50 P M	7 25
Alliance Accommodation	3 45	10 10 A M
Ravenna Accommodation	5 30	8 35
Night Express	‡11 40 P M	6 30 A M

‡ Night Express runs daily, except Saturday, by way of Wellsville, and on Saturday by way of Alliance.

Valley Railway.

ARRIVE.		DEPARTURES.	
No. 2 Accom.	10 15 A M	No. 1 Mail	*8 20 A M
No. 6 Express	1 35 P M	No. 3 Accom.	4 05 P M
No. 4 Mail	6 30 P M	No. 5 Exp.	6 30

Trains leave from Depot foot of South Water Street.

Connotton Valley Railway.

Arrive.		Depart.	
No. 1	10 05 A M	No. 4	4 00 P M
No. 3	7 15 P M	No. 2	8 50 A M

All trains arrive and leave depot corner Commercial and Fifth Streets.

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WOOD ENGRAVER ON WOOD
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JOYFUL News for Boys and Girls!! Young and Old!! A NEW INVENTION just patented for them, for Home use!
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$5 STANDARD ELECTRIC BELT
THAT FAMOUS $5 STANDARD ELECTRIC BELT
gives strength to the Weak and Nervous, and will alone retain its reputation forever as the infallible conqueror of Pain and Disease. Circulars free.
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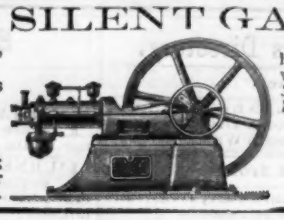
BEST
J. W. PENFIELD
WILLOUGHBY O

NEW OTTO SILENT GAS ENGINE.
Working without Boiler, Steam, Coal, Ashes or Attendance.
Started instantly by a Match, it gives full power immediately.
When stopped all expense ceases.
No explosions; no fires nor cinders; no gauges; no pumps; no engineer or other attendant while running.



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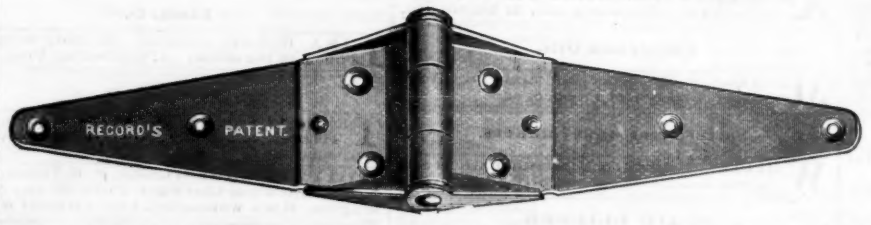
ALBERT FISHER, Agent for Ohio, 48 Merwin Street, Cleveland, O.

WEST POINT BOILER WORKS.
ESTABLISHED 1835.
Removed from 13 Water to Corner 23d and Smallman Streets, PITTSBURGH, PA.
FIRST PREMIUM STEAM
BOILERS,
Stills, Tanks and Sheet Iron Work
of all descriptions made to order on short notice. Have on hand a large stock
New and Good Second Hand Boilers.
REPAIRING DONE PROMPTLY.
R. MUNROE.

Dayton Malleable Iron Co,
Manufacturers of
Air Furnace Iron.
A full line of Carriage and Plow Hardware kept in stock.
Catalogues for the Trade.

Record's Patent Hinge.



THE MAIN PART of this Hinge is of the same style as the ordinary heavy strap. The joint is strengthened by FLANGED SUPPORTS, made of extra quality of iron, spanning the entire width of each leaf, firmly riveted to the back of the hinge. The pintle of the hinge passes through the ear of the flange, thus adding greatly to its strength. Also, by the additional thickness of iron, greatly STIFFENING THE HINGE where most liable to bend, and secure against breaking where the greatest part of the STRAIN COMES. As the straps of the hinge are bent down, forming an offset for the reception of the supports, the hinge is smooth or flat on the back, same as the ordinary hinge. These hinges are neat in appearance, and owing to their great strength admitting of smaller sizes being used than heretofore, render them the most economical, as well as the most desirable hinges made. They are applied the same as ordinary hinges

PRICES PER DOZEN PAIRS.
5-inch, $2.00. 6-inch, $2.80. 8-inch, $4.40. 10-inch, $6.60. 12-inch, $9.40.
Also manufacturers of
Record's Tight Butter Packages and Sap Spouts.
RECORD MAN'F'G CO., Conneaut, O.

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MOSER & THOMPSON,
MANUFACTURERS
Corrugated Iron Siding for Grain Elevators a Specialty.
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CLEVELAND, OHIO.
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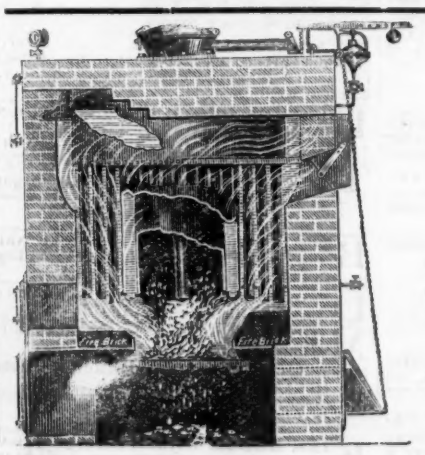
Orders solicited in Bulk, Barrels or Cases.
Scofield, Shurmer & Teagle,



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PROPRIETOR OF
Akron Boiler Works,
Manufacturer of
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Also Heavy Sheet and Boiler Iron Work.
SPECIALTIES:
Rotary Globe Bleach Boilers, and McNeil's Patent Magazine Heating Boilers.
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The IRWIN & REBER PATENT
Expanding Water Conductor,
MANUFACTURED BY THE
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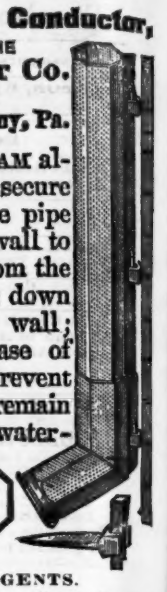
LIMITED,
47 Federal St., Allegheny, Pa.



THE STANDING SEAM allows of an easy and secure fastening, keeping the pipe far enough from the wall to make any overflow from the eave pipe or head, run down the spout, and not the wall; and will open, in case of freezing, so as to prevent bursting, and still remain double-locked and water-tight.

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E. B. Badger & Son, Boston, Mass.; Noyes & Wines, New York; J. S. Thorn, Philadelphia; John G. Hetzell, Baltimore, Md.; R. P. Gormully, Chicago; F. Schmidt & Sons, Milwaukee; Shackelton Bros., Cleveland; Patterson & Hayes, Erie, Pa.; G. H. Peters & Son, Buffalo, N. Y.; James Ackroyd, Albany, N. Y.; Witt & Brown, Cincinnati; Hull & Cozzens' Mnfg Co., St. Louis, Mo., and many others

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Manufacturer of the
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BRAN DUSTER,
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Get the "Wilson" made at Buffalo, N. Y., by the
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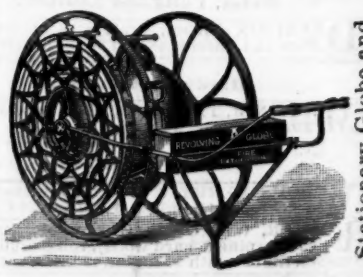

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[Formerly Atlantic & Great Western Railroad.]

For New York, Boston and the East. The shortest and quickest route to Pittsburgh, Washington, Baltimore and the Southeast

Until further notice trains will leave the new Central Depot, South Water Street and Viaduct, as follows:

7:10A.M. LIGHTNING EXPRESS, (daily,) sleeping and hotel coaches from Leavittsburg. 8:55 a.m. To New York, Albany and Boston without change. Parlor car, Cleveland to Salamanca. Arrives at Meadville 11:20 a.m., (dinner); Franklin, 12:33 p.m.; Oil City, 1:00 p.m.; Corry, 1:00 p.m.; Jamestown, (Lake Chatauqua) 1:57 p.m.; Buffalo, 6:15 p.m.; Rochester, 8:30 p.m.; Hornellsville, 6:40 p.m., (supper); Corning, 8:25 p.m.; Elmira, 8:57 p.m.; Binghampton, 10:58 p.m.; Albany, 6:00 a.m.; Boston, 2:45 p.m.; arriving at New York, 6:50 a.m.

10:45 P.M. NIGHT EXPRESS, (daily except Sunday), sleeping Coach from Leavittsburg to New York without change. Arrives at Youngstown 1:45 a.m.; Meadville, 3:50 a.m.; Corry, 5:20 a.m.; Jamestown, 6:22 a.m.; Buffalo, 9:45 a.m.; Rochester, 1:10 p.m.; Hornellsville, 11:20 a.m.; Corning, 12:53 p.m.; Elmira, 1:21 p.m.; Binghampton, 2:50 p.m.; New York, 9:25 p.m.

2:30 P.M. PITTSBURGH EXPRESS,—daily, through without change. Parlor Car, Cleveland to Pittsburgh, arrives at Youngstown, 5:00 p.m.; Pittsburgh, 8:25 p.m; Washington, 7:30 a.m.; Baltimore, 8:15 a.m; via Sharon and Sharpsville to Meadville 7:40 p.m.

4:25 P.M. MAHONING ACCOMMODATION, stopping at all way stations. Arrives at Youngstown, 7:30 p.m; Sharon, 8:30 p.m; Sharpsville 8:40 p.m; connects at Leavittsburg with train No. 20 for Meadville and intermediate points, arrives at Meadville, 11:05 p.m.

7:10 A.M. PITTSBURGH EXPRESS,—(daily) through without change. Arrives at Youngstown, 10:00 a.m.; Sharon, 10:30 a.m.; Sharpsville, 11:05 a.m.; Pittsburgh, 1:05 p.m. Returning, leave Pittsburgh, 4:48 a.m., 8:55 a.m., and 1:15 p.m. and 4:20 p.m.

11:15 A.M. YOUNGSTOWN & PITTSBURGH Accommodation, stopping at all Way Stations, arriving at Youngstown 2:10 p.m.; Pittsburgh, 6:10 p.m. Trains arrive at Cleveland, 6:50 a.m., 10:55 a.m. 3:10, p.m. 7:00 p.m., and 10:15 p.m.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City, and intermediate points WITHOUT CHANGE. No change to Boston and New England cities.

Baggage Checked Through to All Points East

☞ Through Tickets and information regarding the route can be obtained at the Union Ticket Office, corner Bank and Superior streets; at office 131 Bank street, and at new Depot of New York, Pennsylvania and Ohio Railway, South Water street and Viaduct, Cleveland.

WM. B. SHATTUC,
Gen. Pass'r. Agt., Cleveland, Ohio.

M. L. FOOTE,
P. D. COOPER, Pass. Agt., 131 Bank st.,
Gen. Man'gr. Cleveland. Cleveland.

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POPULAR THOROUGHFARE

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Connections in Union Depots for all Points.

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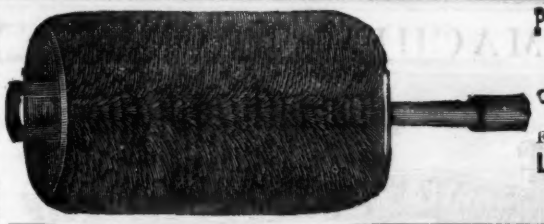

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Best in the Market.
Made any size required.
Combines the properties of a Scraper and Brush.
Full stock always on hand.
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STEEL CASTINGS

FROM 1-4 TO 15,000 LBS. WEIGHT. TRUE TO PATTERN, sound and solid, superior in strength, toughness and durability to iron forgings in any position, or for any service whatever. Gearing of all kinds, Shoes, Dies, Hammerheads, Crossheads, Rockers and Piston Heads for Locomotives, etc. 15,000 Crank Shafts and 10,000 Gear Wheels of this Steel now running prove its superiority over other Steel Castings. CRANK SHAFTS, CROSSHEADS & GEARING SPECIALTIES. Circulars and Price Lists free.

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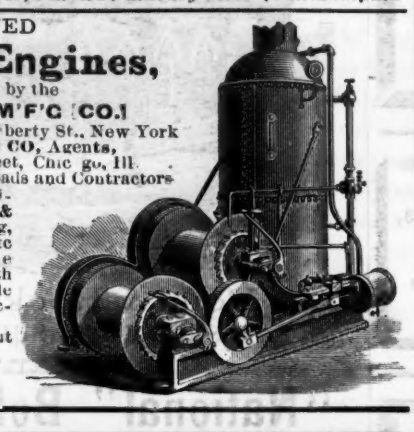

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Sizes from 3½x6½ to 18x22.
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all sizes and kinds, with and without Axles.
Chilled Faced R. R. Frogs.
STREET RAILROAD TURNOUTS
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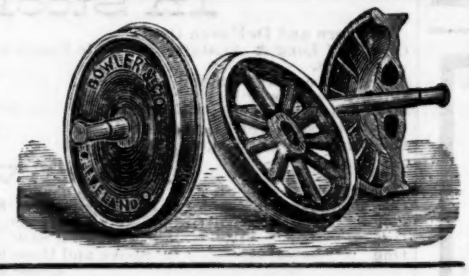

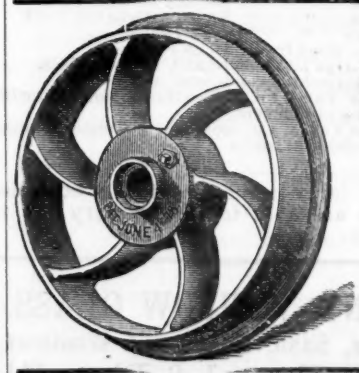

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The strongest, safest and most economical explosive KNOWN TO THE ARTS.

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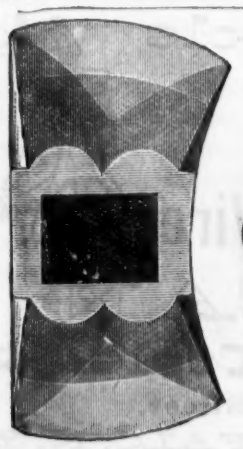

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Manufacturer of
Axes and Edge Tools.
JAMESTOWN, N. Y.
Send for prices to the Trade.

CLEVELAND & PITTSBURGH RAILROAD.

Trains leave and arrive daily, (Sunday excepted,) at the points named below, as follows:

MAIN LINE—GOING WEST.

	Western Expr'ss.	Mail Expr'ss.	Fast Line	Accom.
Leave				
Pittsburgh	7 30 a m.	2 00 pm	11 50 pm	.....
Allegheny	7 40	2 10	12 00 am	.....
Arrive				
Rochester	8 23	3 00	12 50	.....
Beaver	8 30	3 05	12 55	.....
E. Liverpool	9 08	3 37	1 37	.....
Wellsville	9 18	3 47	1 50	.....
Salineville	9 57	4 24	2 33	.....
Bayard	10 34	5 02	3 21	.....
Alliance	11 05	5 25	3 55 am	.....
Leave				
Alliance	11 10	5 25	4 05	7 30 am
Arrive				
Ravenna	11 48	5 59	4 47	8 15
Hudson	12 13 p.m.	6 23	5 15	8 50
Cleveland	1 15 p.m.	7 25 pm	6 30 am	10 10 am

Accommodation train leaves Ravenna at 6.45 a. m., arrives Hudson 7.15 a.m., Cleveland 8.35 a.m.

☞ Mail Express runs through Parlor Car, Fast Line and Western Express through Sleeping Car Pittsburgh to Cleveland.

NOTE.—Fast Line leaves Pittsburgh Sunday night, but not on Saturday nights.

MAIN LINE—GOING EAST

	Pittsb'g Expr'ss.	Fast Line.	Day Expr'ss.	Accom.
Leave				
Cleveland	8 00 am	1 50 pm	11 40 pm	3 45 pm
Arrive				
Hudson	9 05	2 50	12 50 am	4 55
Ravenna	9 37	3 17	1 18	5 30
Alliance	10 20	3 53	2 05	6 20 pm
Bayard	10 54	4 16	2 49	.....
Salineville	11 40	4 51	3 40	.....
Wellsville	12 20 pm	5 20	4 35	.....
E. Liverpool	12 54	5 44	4 57	.....
Beaver	1 30	6 17	5 47	.....
Rochester	1 35	6 22	5 52	.....
Allegheny	2 30	7 05	6 45 am	.....
Pittsburgh	2 40	7 15	6 55	.....
Harrisburg	.....	3 50 am	4 00 pm	.....
Baltimore	.....	7 30	7 30	.....
Washington	.....	9 02	8 47	.....
Philadelphia	.....	7 20	7 35	.....
New York	.....	10 25	10 35	.....
Boston	.....	8 00 pm	.....	.....

Accommodation train leaves Cleveland Union Depot at 5.30 p m, arrives Hudson 6.50 p.m., Ravenna 7 20 p m.

All trains connect at Yellow Creek for Wheeling and Bellaire.

☞ Pittsburgh Express runs a Parlor Car Cleveland to Pittsburgh. Fast line runs Through Sleeper to New York. Day Express runs Through Sleeper to Pittsburgh.

TUSCARAWAS BRANCH.

Trains leave Bayard at 11.00 a.m. and 5.10 p.m. arrive Minerva 11 08 p.m and 5 20 p m : arrive Dover 12 18 p m and 7.15 p.m., New Philadelphia 12.30 p.m. and 7.30 p m. Returning leave New Philadelphia at 7.00 a m. and 2.05 p. m., Dover at 7.30 a.m. and 2 15 p m. Minerva at 9 45 a.m. and 3 28 p m., Bayard at 10 00 a.m and 3 33 p.m.

All trains arrive except Sunday

D. W. CALDWELL, General Manager. E. A. FORD, G'n'l Pass. & Tkt. Agt. Pittsburgh, Pa.

E. E. GARVIN & CO.

Manufacturers of

Milling Machines, Drill Presses
Hand Lathes, Tapping Machines, Cutter Grinders and Wood Planers, Milling Cutters, all shapes and sizes. Gear Cutting and Milling in all its branches. Send for Illustrated Catalogue.

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Cornell's Building, NEW YORK.
☞ Send for Illustrated Catalogue.

SAFETY STEAM, WATER, & HAND POWER
GIVE HATCH SIZE, & ELEVATION OF **ELEVATORS.**
BUILDING, & SEND FOR ILLUSTRATED CIRCULAR.
C. H. MITCHELL & CO.
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MEAD'S IMPROVED PATENT DISINTEGRATER.

For disintegrating, granulating or grinding without friction all kinds of material. It requires less power and grinds faster than any machine in the market. Is strong and simple; not liable to get out of order; no annoyance to workman from dust, and is the best machine in the market for grinding sugar, glue, sumac or drugs. Descriptive pamphlets will be sent free on application to MEAD & CO., 32 Atwater street, DETROIT, MICH.

Please say where you saw this advertisement.

Toledo Saw and File Works.
E. C. PECKHAM,
Manufacturer of all kinds of
CAST STEEL SAWS.
Repairing promptly attended to. Thin Planer Knives a specialty. Also manufacturer and jobber of FILES. Old Files Re-Cut. 6 St Clair street, TOLEDO, O.

HATCH PRINTING CO.
Every description of
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Catalogues, Letter Heads, Envelopes, &c., &c.
38 South Water Street,
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GRAY, SHOOK & CO.,
Pipe Fitters and Brass Founders,
Manufacturers of
Babbitt Metals, &c.
Nos. 5 to 13 Second Avenue,
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GEORCE MITTINGER,
Metal Spinner,
in Brass, Copper, Tin, Zinc, German Silver, &c.
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Also Manufacturer of the "Star Cuspador."

Estimates and Specifications furnished free.
JOHN E. CHAFER,
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Practical Steam Fitter.
LOW PRESSURE A SPECIALTY.
Men sent to all parts of the country, and no boys sent to do a mechanic's work.
All Orders promptly attended to.

Established 1866.
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Gentlemen's Clothes Cleaned, Dyed and Repaired a Specialty.
Office, 119 Seneca Street,
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Manufacturer of
Elevator Bucket & Chain Belting
For elevating, conveying and driving purposes.
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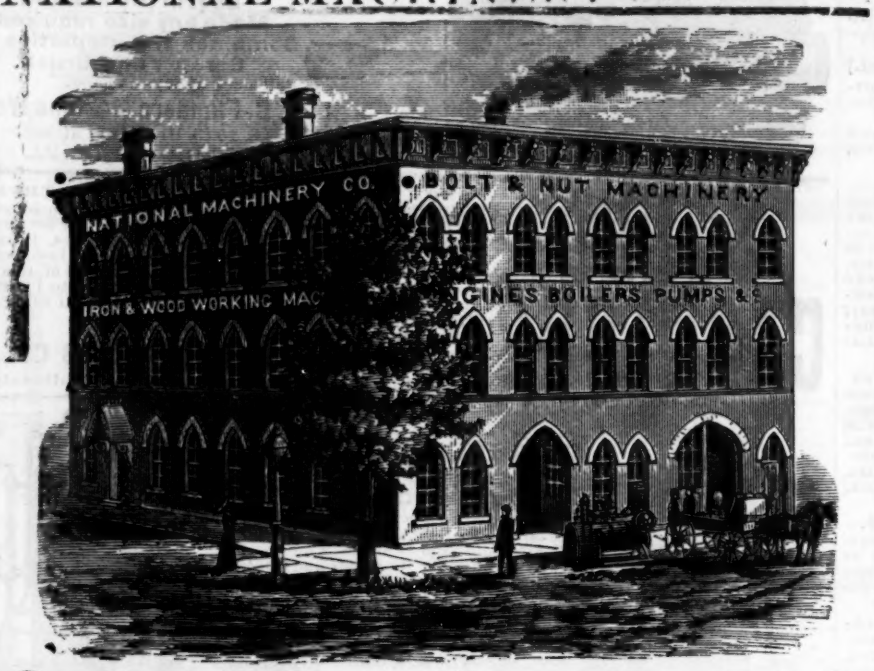
NERVOUS and debilitating diseases a thirty years' specialty; the result of treatment exhibiting irrefragably how enfeebled health and vitality, arising from enervating influences, over taxation, etc., may be re-established and all impediments removed. The remedies adopted are such that beneficial results become manifest immediately. Average duration of treatment necessary for restoration, forty days. **"Treatise and Form of Correspondence"** for patient's guidance, sent in plain envelope on receipt of two cent stamps, but where convenient *visit preferred*. Separate consulting rooms. Hours 8 A. M. to 9 P. M.
Call, or address, 198 St. CLAIR STREET, CLEVELAND, OHIO.
DR. CLEGG

NATIONAL MACHINERY COMPANY



Cor. Bond & Rockwell Streets, Cleveland, O.
SALESROOM—384 SUPERIOR STREET, CORNER BOND.
Manufacturers of
"National" Bolt and Nut Machinery,
Agents and Stock kept of Pratt & Whitney's Screw Cutting Tools, Taps, Dies, &c. Agents for J. A. White's, Levi Houston's and J. S. Graham & Co.'s Wood Working Machinery.
STOCK KEPT OF IRON AND WOOD WORKING MACHINERY,
Boilers & Engines.

In Stock for Sale:

One Thorn and DeHaven Drill.
One No. 7 Long & Allstatter's Double Punch and Shears,
One 4-horse power Engine and Boiler.
One 6-horse power Engine and Boiler
One 7-horse power Engine and Boiler.
One 10-horse power Engine and Boiler.
One 5-horse power Engine.
One 8-horse power Engine.
One 12-horse power Engine.
One 25-horse power Engine. New.
One 30 horse power Engine. New.
One 35-horse power Engine. And several others all in stock.
New and Second Hand Belting, Pulleys, 2 Water Motors, &c., &c.

List of Wood Tools.

One second-hand Frank two-spindle Shaper, $65.
One " " wood frame 2-spindle Shaper, $35
One " " " " Cutting-off Saw, $30
One " " " " Spoke and Handle Lathe $125
One " " 22 inch Greenwood Heading Planer, $125
One " " Ellis Blind Slat Tenoner.
One " " 24-inch Ball & Co., Planer and Matcher.
One " " Power Rod and Dowell machine
One " " Fay & Co. No. 1 Railway Cut off Saw.
Two " " Sandpaper Drums.
One second-hand Dimension Planer, 24-inches, with Feed attachment.
One " " wood frame swing Cut-off Saw and Table.
One " " Slotting machine.
One " " Thorn & Dehaven Drill.
Two " " Saw Tables.
One wood frame 6 inch Sticker.
Large lot second-hand Trenton Vises.
Large lot second-hand Anvils.
One Fay & Co. Agricultural Morticer, with boring attachment.
One Fay & Co. iron frame Tenoning machine, double heads.

Having moved our Salesroom to the large room previously occupied by the Wilson Sewing Machine Company, we are able to carry a very fine line of Wood Working Machinery and other Tools.

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CLEVELAND WINDOW GLASS CO.
For Doors, Sash, Blinds and Windows,
American, French & Plate Glass
73 Michigan Street and 132 Champlain Street.
Cleveland, Ohio.

NIAGARA STAMPING AND TOOL CO.,
Manufacturers of
Power and Foot Presses,
Dies and Tools
FOR WORKING
Sheet Metal and Wire.

FRUIT CAN
And Tinners' Tools, &c.
Nos. 147 and 149 Elm Street,
BUFFALO, N. Y.

Cleveland, Akron and Columbus RAILROAD.

Trains leave and arrive daily (Sundays excepted) at the points named below.

GOING SOUTH.

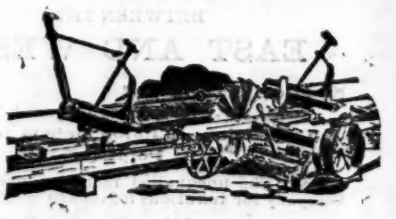
STATIONS. February 20, '82.	Miles	Mail and Expr 2	Thro' Pass'gr 4	Accom 6	Accom 8
		A.M.	P.M.	P.M.	
Cleveland		8.00	1.50	3.45	
Hudson (1)	0	9.15	3.00	5.05	
Cuyahoga Falls	8	9.32	3.18	5.23	
Akron (2)	14	9.47	3.35	5.36 / 5.50	
Clinton	27	10.17	4.04	6.23	
Warwick	28	10.23	4.10	6.31	
Marshallville	33	0.35	4.23	6.45	
Orrville (4)	39	10.51	4.43	7.03	
Fredricksburg	52	11.22	5.16	7.37	
Holmesville	56	11.34	5.28	7.52	A.M.
Millersburg	62	11.48	5.41	8.05	5.40
		P.M.			
Killbuck	68	12.02	5.55		5.54
Black Creek	74	12.16	6.09		6.08
Gann	8	12.41	6.35		6.33 / 6.53
Danville	8	12.55	6.49		7.07
Howard	91	1.05	6.59		7.18
Gambier	95	1.15	7.11		7.29
Mt. Vernon (5)	100	1.20	7.27		7.43
Mt. Liberty	109	1.58	7.47		7.50
Centerburg (6)	114	2.08	7.57		8.10
Condit	120	2.22	8.11		8.24
Sunbury	124	2.31	8.20		8.35
Galena	126	2.36	8.26		8.41
Westerville	33	2.51	8.42		8.58
Columbus (7)	145	3.15	9.06		9.23

GOING NORTH.

STATIONS. February 20, '82.		Thro' Pass'gr 1	Mail Expr 3	Accom 5	Accom 7
		A M.	P M		P.M.
Columbus	0	6.00	12.15		5.05
Westerville	12	6.25	12.41		5.32
Galena	19	6.41	12.57		5.49
Sunbury	21	6.47	1.03		5.55
Condit	25	6.56	1.13		6.06
Centerburg	31	7.10	1.27		6.20
Mt. Liberty	36	7.20	1.38		6.32
Mt. Vernon	45	7.43	2.02		6.59
Gambier	50	7.55	2.15		7.11
Howard	54	8.05	2.25		7.22
Danville	59	8.15	2.36		7.34
Gann	68	8.30	2.50		7.49
Black Creek	71	8.56	3.15		8.15
Killbuck	77	9.10	3.28		8.29
				A.M.	
Millersburg	8	9.26	3.43	5.50	8.42
Holmesville	89	9.37	3.55	6.05	
Fredricksburg	93	9.49	4.06	6.18	
Orrville	06	10.23	4.43	6.40 / 7.10	
Marshallville	12	0.35	4.55	7.23	
Warwick	117	10.46	5.09	7.37	
Clinton	118	10.52	5.15	7.46	
Akron	31	11.28	5.47	8.22	
Cuyahoga Falls	137	11.41	6.00	8.35	
Hudson	145	12.00 M	6.18	8.55	
Cleveland		1.15 P M	7.25	10.10	

N. MONSARRAT, Gen'l Supt. Akron, O
E. T. AFFLECK, General Passenger Ag't, Columbus, O.

E. Fawcett. R. B Fawcett.
E. FAWCETT & SON,



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